MYCOLOGIA

VOL. XI JULY, 1919 No. 4

ROSTRONITSCHKIA, A NEW GENUS OF PYRENOMYCETES

HARRY MORTON FITZPATRICK

(WITH PLATE 11)

An interesting Pyrenomycete parasitic on the leaves of *Gesneria albiflora* Kuntze was collected on the Island of Porto Rico in the winter of 1915 by a party of botanists representing the New York Botanical Garden. Material of this collection was studied later by Rehm, who stated in a letter to F. J. Seaver that he regarded the fungus as an undescribed species. He proposed for it the name *Nitschkia nervincola* Rehm, and inclosed in his letter a detailed Latin diagnosis. This diagnosis, dated June, 1915, is attached to the packet of material of this collection in the herbarium of the New York Botanical Garden, but apparently has not been published.

The fungus had been collected previously in 1913 and in 1914 in Porto Rico by F. L. Stevens. Specimens of some of his collections, sent to the New York Botanical Garden, were examined by Seaver and found to be identical with the material studied by Rehm. Subsequently ten different collections were deposited by Stevens in the herbarium of the University of Illinois, and in a paper[1] on Porto Rican fungi he lists them under the name *Nitschkia nervincola*. He does not describe the species, and the writer has found no other mention of the fungus in literature.

In the winter of 1916, H. H. Whetzel and E. W. Olive made extensive collections of fungi in Porto Rico, and obtained abun-

[1] Stevens, F. L. Porto Rican Fungi, Old and New. Illinois Acad. Sci. Trans. 10: 185. 1917.

[MYCOLOGIA for May (11: 101–161 was issued June 7, 1919.]

dant material of this species in excellent condition for study. Doctor Seaver identified the fungus, and suggested the advisability of studying it critically to determine whether it might not be referred more properly to some other genus. Professor Whetzel generously placed the material at the writer's disposal, and a preliminary examination revealed that the fungus differs in several important respects from other described species of *Nitschkia*. The following summer the examination of all the specimens of this species in the Herbarium of the New York Botanical Garden disclosed the fact that years before Ellis had received a specimen of the fungus collected by Mrs. E. M. Swainson in Jamaica. This specimen contains only material of the imperfect stage, and Ellis labeled it *Botrytis seriata* Ell. & Ev. The date of collection is not given, and the host is not named. The leaves are, however, indistinguishable from those of *Gesneria albiflora* and were probably taken from this host. *Botrytis seriata* was apparently never described by Ellis, and a search of literature has failed to reveal a citation of this name. The fungus is not a species of Botrytis in our present conception of the limits of this genus.

The genus *Nitschkia* Otth is included in the Sphaeriaceae-Allantosporae of Saccardo, and is a member of the Cucurbitariaceae in Lindau's arrangement of the Sphaeriales in Engler und Prantl's "Die naturlichen Pflanzenfamilien." As characterized by Lindau the Cucurbitariaceae possess globose perithecia seated on a more or less well-developed stroma. In the genus *Nitschkia* the perithecia are cespitose to scattered, and rupture a covering membrane, or are more rarely superficial. The perithecial wall is black, membranaceous to subcoriaceous, and collapses on drying, becoming cupulate. The ostiolum is inconspicuous. The asci are clavate, 8-spored, and accompanied by thread-like paraphyses. The spores are allantoid, one-celled, and hyaline. The species are typically saprophytic. Ellis in his "North American Pyrenomycetes" includes in the genus *Nitschkia* only those species in which the perithecia are cespitose, and places in the genus *Coelosphaeria* Saccardo the species with scattered perithecia. Saccardo also has adopted this conception of generic limits.

The parasite under consideration on *Gesneria albiflora* lacks certain characters common to species of *Nitschkia* and *Coelo-*

sphaeria, and possesses others not described for any species in either of these genera. The perithecium is firm, coriaceous to carbonaceous, does not collapse, and is provided with a prominent, long, stout, sulcate beak which resembles strikingly that in certain species of *Eutypa.* The ascus contains eight, distinctly yellowish, allantoid spores. The species has the perithecial characters of a *Eutypa* rather than those of a *Nitschkia.* The stroma, however, is not effuse as in *Eutypa,* and the perithecia are seated on the stroma rather than immersed in it. Moreover the fungus possesses a conidial stage unlike any which the writer has found described either in *Eutypa* or *Nitschkia.* Professor F. L. Stevens, although citing his own material of this species tentatively under the name *Nitschkia nervincola,* has stated in a letter to the writer that he sees no reason at all for so classifying the fungus.

Material was recently submitted by the writer to Doctor C. L. Shear with the request that he examine it, and state whether in his opinion this fungus could be regarded properly as a species either of *Eutypa* or *Nitschkia.* He writes that he prefers not to place the species in either of these genera. Assuming that a genus to which it could be referred has not been described recently, he would regard it as the representative of an undescribed genus. Although there are several recently described genera characterized by allantoid spores, in none of these is the perithecium similar to that of the fungus on *Gesneria.* The writer feels justified, therefore, in regarding this species as representative of an undescribed genus. Since the genus falls properly in the Cucurbitariaceae near *Nitschkia,* and on account of the presence of a perithecium with a long, sulcate beak the following name is proposed.

Rostronitschkia gen. nov.

Stromata black, formed within the host, later erumpent, bearing first conidiophores, and later perithecia. Conidiophores united to form stout, capitate coremia or stalked sporodochia (Plate 11, Figs. 3, 4), bearing hyaline to yellowish, ovate, unicellular conidia. Perithecia developed beneath the conidial layer, pushing upward, at maturity seated in a single row on the stroma; not cespitose as in *Nitschkia.* Perithecial wall black, coriaceous to carbonaceous, prominently wrinkled and roughened, not collapsing, provided with a long, stout, 4-sulcate beak, resembling that in some species

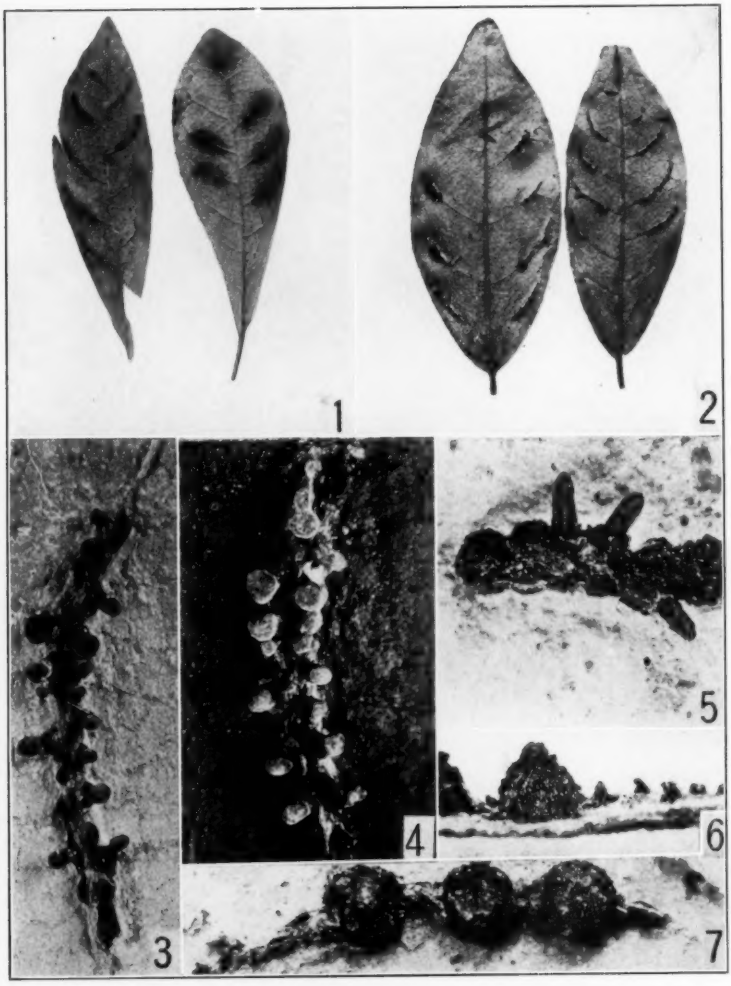
of *Eutypa* (Plate 11, Fig. 5). Ascus clavate, 8-spored, aparaphysate. Ascospores allantoid, yellowish, unicellular.

Rostronitschkia nervincola sp. nov.

Nitschkia nervincola Rehm, in litt.

Stromata formed in the secondary veins of the leaf, more rarely in the midrib (Plate 11, Fig. 2), erumpent on the lower side as very narrow, linear, black cushions, 0.3–0.5 × 2–10 mm.; the upper surface of the leaf immediately opposite these stromata showing definite diseased spots (Plate 11, Fig. 1) which, though sometimes narrow and confined to the upper surface of the vein, commonly spread over a wider area; these spots in early stages often distinctly rose-colored, later turning brown; the ruptured stromata developing first conidiophores and later perithecia; conidiophores pushing outward in compact masses forming numerous, stout, capitate coremia or stalked sporodochia, 275–600 μ in diam. at apex × 400 μ in height, scattered irregularly along the stroma or in one or two rather definite rows (Plate 11, Fig. 3); coremium dusty brown, the apical portion frequently whitish and pruinose with conidia (Plate 11, Fig. 4), composed of yellowish-brown, frequently septate, branching conidiophores, which at the outer ends are abundantly and characteristically marked with scars indicating the points of detachment of conidia; the first conidium borne terminally, the conidiophore then sending out immediately below it a short lateral branch which bears a second conidium; the tip of the conidiophore as the result of the continuation of this process assuming a peculiar crooked appearance; conidia hyaline to yellowish, ovate, somewhat pointed at one end, unicellular, 5–6 × 1.5 μ; perithecia developed beneath the conidial fructifications, and pushing outward so that the latter fall away or remain attached to the outer surface of the perithecial wall; perithecium globose, 1 mm. in diam. seated on the stroma, and provided with a long, stout, 4-sulcate beak attaining a length of slightly more than 1 mm., and terminated by the ostiolum; perithecia borne in a single row along the stroma, adjacent perithecia frequently confluent; perithecial wall dull-black, coriaceous, becoming carbonaceous on drying, not collapsing, prominently wrinkled and roughened; ascus clavate, 8-spored, 18–26 × 5–6 μ; ascospores allantoid, unicellular, at first hyaline, later becoming distinctly yellowish, 6.7–8.4 × 1.7–2 μ, sub-biseriate to irregularly crowded; paraphyses absent.

Parasitic in the leaves of *Gesneria albiflora* in Porto Rico and Jamaica. Not known to the writer from other localities nor on other hosts.



EUTYPANITSCHKIA NERVINCOLA (REHM) FITZPATRICK

Specimens examined:

PORTO RICO, *Maricao;* H. H. Whetzel and E. W. Olive. Exploration of Porto Rico. No. 699, *type* (in N. Y. Bot. Gard. Herb.; in Pl. Path. Herb. Cornell Univ. No. 9656; and in Fitzpatrick Herb. No. 1023); N. L. Britton, J. F. Cowell, Stewardson Brown, The New York Botanical Garden, Exploration of Porto Rico No. 4557 (in N. Y. Bot. Gard. Herb.), material of this collection described by Rehm in a letter to Seaver as *Nitschkia nervincola* Rehm; F. L. Stevens, Univ. Illinois Herb. Nos. 207, 735, 3498, 3670, 6718 (in N. Y. Bot. Gard. Herb.); *Mayagüez,* F. L. Stevens, Univ. Illinois Herb. No. 6725 (in N. Y. Bot. Gard. Herb.).

JAMAICA, *Richmond, Trinity Ville;* Mrs. E. M. Swainson (in N. Y. Bot. Gard. Herb. Ellis Collection). Specimen labeled *Botrytis seriata* Ell. & Ev. by Ellis.

EXPLANATION OF PLATE 11

Fig. 1. Upper surface of leaves of *Gesneria albiflora* parasitized by *Rostronitschkia nervincola.* The diseased spots occur immediately opposite the stromata, which are always hypophyllous. Natural size.

Fig. 2. Lower surface of leaves of the same host showing the stromata of the fungus in the secondary veins and midrib. Natural size.

Fig. 3. A stroma of *Rostronitschkia* bearing coremia of the imperfect stage. × 11.

Fig. 4. The same stroma photographed under different light conditions to emphasize the whitish pruinosity at the apices of the coremia. × 11.

Fig. 5. Mature perithecia of *Rostronitschkia* confluent in a single row on the stroma. Note the prominent, sulcate beaks. × 11.

Fig. 6. A younger perithecium in which the beak has not yet developed. Several coremia of the imperfect stage appear at the right. × 11.

Fig. 7. Three mature perithecia, the beaks of which have been broken away. × 11.

DEPARTMENT OF PLANT PATHOLOGY,
CORNELL UNIVERSITY,
ITHACA, N. Y.

NOTES ON SOME POLEMONIACEOUS RUSTS[1]

C. R. Orton

Of the many problems encountered in taxonomic work with any group of plants that of nomenclature is sure to require a considerable amount of time and often more patience than the worker possesses. There are always some names in question whose identity is not certain because of discrepancies, either with regard to the labelling of type specimens or in connection with the published descriptions. The situation becomes more acute for the taxonomist working with parasitic organisms. Here the chance of error is practically doubled for both parasite and host are concerned.

A good example of such a situation has been encountered in the study of several rusts on polemoniaceous hosts. Several students of the rusts have been puzzled with this particular tangle and some valuable information has come to light. Holway[2] published some notes bearing on these species several years ago but since then few, if any, descriptive notes have appeared. During the preparation of the manuscript on the genus *Allodus* the writer[3] was compelled to reinvestigate this entire group of rusts with the result that some interesting facts have been disclosed which are thought to be of sufficient importance to record for the benefit of subsequent workers.

One of the earlier difficulties in connection with this group of rusts was due to the inaccessibility and consequent uncertainty regarding type specimens. During the summer of 1918, through the efforts of Dr. J. C. Arthur, Prof. H. S. Jackson, and other members of the botanical staff of the Purdue Agricultural Ex-

[1] Joint contribution from the Department of Botany, Indiana Agricultural Experiment Station, and the Department of Botany, The Pennsylvania State College, No. 16.

[2] Holway, E. W. D. Notes on Uredineae, IV. Jour. Myc. **11**: 268. 1905.

[3] Orton, C. R. North American Species of Allodus. Mem. N. Y. Bot. Garden **6**: 198–200. 1916.

periment Station, I was enabled to complete the examination of the types or portions of types of nearly every species here discussed and some of the uncertainties existing heretofore appear to be cleared up as thoroughly as it is possible to do so until cultures are made to verify their life histories.

Most of the uncertainties regarding the phlox rusts have centered around the well known species *Puccinia plumbaria* Peck, which is a rather common rust throughout the Rocky Mountain region on *Microsteris* and *Phlox*. Inasmuch as most of the confusion has been due to uncertainties and errors in host determinations considerable time has been given to the identification of the hosts, particularly the hosts of the type specimens. These have been submitted to various experts on this family such as Dr. P. A. Rydberg, Mr. P. C. Standley, and others to whom I extend thanks for their interest and the time they have taken from their many duties to make these studies.

For convenience in discussion, I have divided these rusts into three groups as follows: (1) *Allodus Giliae*, (2) *Allodus Douglasii* and (3) *Other outstanding species*.

1. ALLODUS GILIAE (Peck) Orton

Aecidium Giliae Peck, Bot. Gaz. **4**: 230. 1879

This species was founded on a collection by M. E. Jones from Alta, Wasatch Mts., Utah, in August at an elevation of 8,000 ft. on leaves of *Gilia Nuttallii*. A portion of the type collection in the Peck herbarium was very kindly loaned by Dr. H. D. House and was found to bear aecia only. The host is undoubtedly named correctly and has been verified by Mr. Standley.

Another collection in the Peck herbarium was made by Jones at Alta, 10,000 ft. elevation, on the same host and bears only telia which appear in every way identical with *Puccinia plumbaria*.

Puccinia plumbaria Peck, Bot. Gaz. **6**: 228. 1881

Peck described this conspicuous rust on the living leaves and stems of *Collomia gracilis* and *Phlox longifolia* from material collected by M. E. Jones in Utah and his description says in "June and August." The most striking gross character of this

rust is the plumbeous appearance of the telia which are found on the leaves and stems. When the telia rupture, powdery, chocolate colored spores appear which upon microscopic examination are found to be finely but conspicuously verrucose. This surface marking of the teliospores is most pronounced upon the host genera *Microsteris* (*Collomia*) and *Phlox* and less evident upon the host genera *Leptodactylon* and *Linanthus,* although on the latter genera the verrucose markings are easily seen when the spores are examined dry under the higher objectives of the microscope. Teliospores from the type material measure 19–25 by 31–40 μ with the apex 5–7 μ thick and the pedicel fragile, colorless and fugaceous.

Both hosts mentioned by Peck in the original description are correct, but there is a discrepancy in the dates. The type material on *Microsteris* (*Collomia*) in the Peck collection bears the date May 5, 1880, and the "co-type" on *Phlox* bears the date June 6, 1880. There is no collection by Jones on *Collomia* in the Peck herbarium bearing the August date. We must therefore conclude that the dates in the original description should have been May and June.

Puccinia Wilcoxiana Thüm. Myc. Univ. *2032.* 1881

The original description of this rust is in Latin printed upon the exsiccatum label. The type was stated to be on some undetermined species of *Gilia* collected at Boise City, Idaho Territory, April, 1881, by J. E. Wilcox.

A small portion of the type material has been examined and appears identical with *Puccinia plumbaria* as that fungus appears on *Microsteris.* While the host material is rather scanty it has been possible to determine the host as *Microsteris humilis* Greene an annual plant clearly distinct from *Gilia Nuttallii* A. Gray which is perennial.

The question of priority of name arises with respect to this and the preceding species. In the New York Botanical Garden Herbarium there is a letter from Dr. W. G. Farlow to Mr. J. B. Ellis with regard to this matter. Dr. Farlow is of the opinion that Century XXI of Thümen's Mycotheca Universalis was not issued until after June and that Peck's name has precedence.

Another bit of substantiating evidence is the date of collection, April, 1881. It would hardly be possible for specimens collected in Idaho on this date to be sent to Europe and issued in an exsiccatum before June, the time of publication of *Puccinia plumbaria.*

Puccinia plumbaria phlogina Ellis. N. Am. Fungi *1044.* 1883

Ellis issued a collection under this name in the above exsiccatum but failed to publish a description for it. The name is therefore a hyponym. The host was said to be *Phlox Nuttallii* and the specimen was collected by Harkness in California in 1884. There is in the herbarium at Albany a specimen which is undoubtedly a portion of this collection. The host is *Phlox longifolia* Nutt. and the rust is *Allodus Giliae.* Owing to the advanced stage of the rust when collected the plumbeous character is less evident than usual, a fact which no doubt led Ellis to assign a varietal name to this specimen.

Aecidium Wilcoxianum Thüm. Myc. Univ. *2226.* 1884

Under this name a collection made at Boise City, Idaho, April, 1881, by Dr. J. Wilcox, was issued by Thümen without description. It was said to be upon *Phlox Douglasii* but the specimens in the Arthur Herbarium are too fragmentary for host determination. The rust appears to be identical with *Aecidium Giliae* Peck. What appears to be a portion of the same collection was issued under the same name in Roumeguere Fungi selecti exsiccati *5213.* Being issued without description in both cases the name is to be cited as a hyponym.

Aecidium Cerastii Winter; Winter & Demetrio, Hedwigia **24**: 179. 1885

This species was described in an article by Winter and Demetrio entitled "Beitrage zur Pilzflora von Missouri," which appeared in "Heft V" (September and October). In the Jour. Myc. **1**: 126. 1885, No. 10 (October), an article by Dr. Winter appeared under the title "Fungi Novi Missourienses" in which he describes *Aecidium Cerastii* Winter nov. spec. with the identical Latin description used in Hedwigia. What evidence there

is seems to indicate that the Hedwigia article appeared first and is therefore to be given preference in citation. The type was described as on living leaves of *Cerastium nutans* Raf. May, 1885. No. 559. A collection which is a portion of the type bears a label with this further information "near Joh. Hof's residence, Perry Co., Mo.," collected by C. H. Demetrio. A careful examination of the type which is in the possession of Rev. Demetrio shows that the host is probably *Phlox divaricata* and the rust certainly *Allodus Giliae* comparing exactly with similar material on *P. divaricata* from Iowa.

Aecidium Phlogis Peck; Arth. Bull. Iowa Agr. Coll. **1884**: 167. 1885

This name was used by Arthur in a "Preliminary List of Iowa Uredineae" to designate a collection on *Phlox divaricata* var. *Laphamii* Willd. collected at Decorah, Iowa, June 8, 1882, by E. W. D. Holway. On careful examination of this specimen a few telia were found and the rust is *Allodus Giliae* without doubt. The collection on *Phlox pilosa*, Ames, cited under the same name has not been seen and its identity is unknown. No description accompanies the name and it is therefore a hyponym.

Puccinia patagonica Speg. Bol. Acad. Nac. Ci. Argent. **11**: 29. 1887

Spegazzini described this species from collections made at Rio S. Cruz and Rio Gallego, January and August, 1882, on a common *Collomia*. The host species however was not named.

The type collection of this rust has not been seen but the description fits *Allodus Giliae* very closely. Dr. W. G. Farlow sent the writer a specimen from the Farlow collection labelled "Sydow Uredineen 35a. *Puccinia plumbaria* Peck in foliis calcibusque *Collomiae* sp. Ad Mont. ignion. Colloqui. 1. 1896." This was collected by Neger in Chili. The specimen bears telia only which are apparently identical with those of *Allodus Giliae*. This indicates that *A. Giliae* occurs in South America and substantiates the view that Spegazzini's species is probably identical with *A. Giliae* and should be entered in the synonymy of this species.

The observation of Spegazzini that *P. patagonica* differs wholly from *Puccinia Giliae* Farl. is quite correct. We interpret this reference to *P. Giliae* Farl. as an error for *P. Giliae* Ellis & Hark. which is discussed later in this paper.

Puccinia fragilis Tracy & Gall. Jour. Myc. **4**: 20. 1888

The type collection was described as on *Arenaria pungens* collected at Reno, Nevada, June 19, 1887. Holway[4] has called attention to the host plant which he says is *Phlox*. In the Arthur Herbarium there are three packets purporting to be portions of the type collection. One was taken from the collection of S. M. Tracy, July 5, 1900, and bears the data above and the collectors names, Tracy & Evans. Another specimen marked "type" was received from a collection in the Iowa Agr. College in October, 1898, and bears the same inscription except that Evans's name does not appear on the packet as co-collector. The third packet came from the Holway Herbarium and bears the number *4591*, otherwise the inscription is like that on the first mentioned packet. Examination of the material shows only telia. The host is probably *Phlox longifolia* Nutt. and the rust is certainly *Allodus Giliae*.

Aecidium Phlogis Ellis & Ev. Bull. Torr. Club. **24**: 284. 1897

This species was described from a collection on *Phlox longifolia*, made near Lewistown, Idaho, April, 1896, by A. A. Heller (No. 2992). Ellis and Everhart published the following note with the description: "This is not improbably the *Aecidium* of *Puccinia plumbaria* Peck which is found on the same host." What is apparently a portion of the type collection was issued by Ellis & Ev. in N. Am. Fungi *3582* and is most certainly the aecial stage of *Allodus Giliae* although I have seen no specimens of this collection bearing telia on the same plant.

Puccinia Purpusii P. Henn. Hedwigia **37**: 270. 1898

Hennings described this species from a collection made by Mr. C. A. Purpus in California. The original description included both aecia and telia and purports to have been collected at Potter

[4] Holway, E. W. D. (loc. cit.).

Valley, Mendocino Co., California, on *Arabis spec.* Holway (1) was apparently the first to call attention to the fact that the rust was *Puccinia plumbaria* and the host some species of *Phlox* or a closely related genus.

The type collection has been examined through the kindness of Dr. P. Sydow, who loaned all the material with the original label to Dr. Arthur for study. The label reads as follows: ("Uredo?) No. 3. on Cruciferae? spec. Potter Valley, Mendocino Co., Calif. A. P. 94." This is in the handwriting of Mr. Purpus, who has recently confirmed it from a photograph of the label sent him by the writer. After the figure "3" the name *Purpusii* is written, but by a different hand, very probably Dr. Hennings. This is undoubted type material and consists of several fragmentary stems and leaves of some plant closely resembling *Microsteris gracilis.* Most of the leaves bear the aecial stage, but one leaf is well covered with telia of the plumbeous sort. The rust is without doubt *Allodus Giliae.*

Puccinia giliicola P. Henn. Hedwigia **37**: 270. 1898; Rab.-Paz. Fungi Eur. *4221.* 1901

Much confusion has existed concerning the exact identity of this species. Hennings published it under the name *P. Giliae* Ellis & Hark. The type being collected on *Gilia californica* at Snow Mt., Coast Range, California, about 7,000 ft. Aug.–Sept., 1894 (A. Purpus). What is undoubtedly the same rust and host and probably a portion of the same collection has been issued under Rabenhorst-Pazschke, Fungi Europaei et extraeuropaei *4221,* and Sydow, Uredineen *1212* but the locality in both of these exsiccati numbers reads, Potter Valley, Mendozo (Mendoc in Sydow Ured. *1212*) Co., Calif., instead of Snow Mountain, Coast Range. Whether there was another collection I have not been able to determine but authentic type material kindly loaned by Dr. P. Sydow with the original penciled label written on American paper reads "Pilz on *Gilia?* Spec. . . . Snow-Mt. Coast-Range—Aug.–Sept. 7500–8000 ft." This label was photographed and sent to Mr. C. A. Purpus, Vera Cruz, Mexico, who writes as follows: "The label enclosed in your letter was written by me.

The fungus was collected on a Gilia spec. growing on rocks at an alt. of 7–8000 ft. on Snow Mt., in the Coast Range of Lake County in northern California. Snow Mountain is one of the highest elevations in the Coast Range as far as I know." Prof. T. S. Brandegee writes that "Snow Mountain is a well known high mountain situated at the corner of Lake and Mendicino Counties, California." It seems probable therefore that in some way the locality for the type collection of *P. giliicola* was confused by Hennings with that of *P. Purpusii* which would account for the discrepancy in localities on the different packets. The specimens in all the packets considered here are identical.

The host of *P. giliicola* is an acerose leaved plant, small and apparently well adapted for dry climates. The rust is in the advanced telial stage only and the sori are not noticeably plumbeous. The spores average a little narrower than those of *Allodus Giliae* being 15–21 × 32–45 μ and are practically smooth. In this respect it compares favorably with collections on *Leptodactylon Nuttallii, Microsteria gracilis* and *Linanthus ciliatus.* Many taxonomists would consider this a distinct species but I believe it to be only a depauperate form of *A. Giliae.* The "uredospores" mentioned by Hennings in the published description are apparently mesospores or single cells of broken teliospores as no urediniospores have been found after several careful examinations.

Aecidium patagonicum Speg. Anal. Mus. Nac. Buen. Aires 3ª. 1: 66. 1902

Spegazzini described this Aecidium on living leaves of *Collomia gracilis* collected near Carren-leofú, in the summer of 1900 (N. Illin.). He says this *Aecidium* appears with *Puccinia Patagonica* and it is probable that the two stages belong together. The type of *A. patagonicum* has not been seen but Spegazzini gives the measurements of aeciospores as 14–16 μ which compare closely with those of *Aecidium Giliae* Peck.

Following is a list of synonymy and host plants of

ALLODUS GILIAE (Peck) Orton, Mem. N. Y. Bot. Gard. **6**: 199. 1916

Aecidium Giliae Peck, Bot. Gaz. **4**: 230. 1879.
Puccinia plumbaria Peck, Bot. Gaz. **6**: 228. 1881.
Puccinia Wilcoxiana Thüm. Myc. Univ. *2032*. 1881.
Puccinia plumbaria phlogina Ellis, N. Am. Fungi *1044*. 1883 hyponym.
Aecidium Wilcoxianum Thüm. Myc. Univ. *2226*. 1884 hyponym.
Aecidium Cerastii Wint.; Winter & Demetrio, Hedwigia **24**: 179. 1885; Jour. Myc. **1**: 125. 1885.
Aecidium Phlogis Peck: Arth. Bull. Iowa Agr. Coll. **1884**; 167. 1885 hyponym.
Puccinia patagonica Speg. Bul. Acad. Nac. Ci. Argent. **11**: 29. 1887.
Puccinia fragilis Tracy & Gall. Jour. Myc. **4**: 20. 1888.
Aecidium Phlogis Ellis & Ev. Bull. Torr. Club **24**: 284. 1897.
Puccinia Purpusii P. Henn. Hedwigia **37**: 270. 1898.
Puccinia giliicola P. Henn. Hedwigia **37**: 270. 1898; Rab.-Paz. Fungi Eur. *4221*. 1901.
Dicaeoma fragile Kuntze, Rev. Gen. **33**: 468. 1898.
Dicaeoma plumbarium Kuntze, Rev. Gen. **33**: 470. 1898.
Aecidium patagonicum Speg. Anal. Mus. Nac. Buen. Aires. 3ª. **1**: 66. 1902.
Allodus plumbaria Arth. Result. Sci. Congr. Bot. Vienne 345. 1906.

ON POLEMONIACEAE

Leptodactylon californica H. & A. (*Gilia californica* Benth.) California.
Leptodactylon Nuttallii (A. Gray) Rydb. (*Gilia Nuttallii* A. Gray.) Colorado, Nevada, Utah.
Linanthus ciliatus (Benth.) Greene. (*Gilia ciliata* Benth.) California.
Microsteris gracilis (Dougl.) Greene. (*Collomia gracilis* Dougl. Gilia gracilis Hook.) California, Montana, Oregon, Utah, Washington.
Microsteris humilis Greene, Idaho, Utah.

Microsteris micrantha (Kellogg) Greene. (*Collomia micrantha* Kellogg.) Colorado, Montana, Utah.
Phlox divaricata L. Illinois, Iowa, Missouri.
Phlox longifolia Nutt. California, Colorado, Idaho, Nevada, Utah.
Phlox multiflora A. Nels. Colorado.
Phlox speciosa Pursh. Oregon.
Phlox Stansburgii (Torr.) Heller. Nevada.

2. ALLODUS DOUGLASII (Ellis & Ev.) Orton

Puccinia Douglasii Ellis & Ev. Proc. Acad. Phil. **1893**: 152. 1893

The species was described on *Phlox Douglasii* collected at Detroit, Utah, May 26, 1891, by Marcus E. Jones. The rust differs quite markedly from *Puccinia plumbaria* in that the telia arise from a diffused mycelium usually in linear series on each side of the midrib and the sori are very early naked and prominently pulvinate. The spores are much thickened above with smooth walls and concolorous persistent pedicels. The aecial stage differs in no pronounced way from the aecial stage of *P. plumbaria* and it is extremely difficult to decide where certain aecial collections belong. *Puccinia Douglasii* however seems to constantly inhabit acerose or narrow leaved species of *Phlox* and the aecia do not change the form of the leaf so pronouncedly as do the aecia of *P. plumbaria*. A portion of the type material was submitted to Mr. Standley, who identifies the host as *Phlox diffusa*. *Puccinia Douglasii* therefore is not at present known to inhabit *Phlox Douglasii*.

Puccinia Richardsonii Sydow, Monog. Ured. **1**: 317. 1902

The Sydows described this species from material collected at Helena, Montana, May, 1896, on *Phlox Richardsonii* by F. D. Kelsey, and issued by Ellis and Everhart in N. Am. Fungi *2991* under the name *Puccinia Douglasii*. The host is apparently *Phlox diapensioides* Rydb. and the rust differs in no essential character from *P. Douglasii* on *Phlox diffusa* except that the spores average a little longer.

Following is a list of the synonymy and hosts of

ALLODUS DOUGLASII (Ellis & Ev.) Orton, Mem. N. Y. Bot. Gard. **6**: 198. 1916

Puccinia Douglasii Ellis & Ev. Proc. Acad. Phila. **1893**: 152. 1893.

Dicaeoma Douglasii Kuntze, Rev. Gen. **33**: 468. 1898.

Puccinia Richardsonii Sydow. Monog. Ured. **1**: 317. 1902.

ON POLEMONIACEAE

Phlox alyssifolia Greene. Montana.

Phlox amoena Sims. (*P. procumbens* A. Gray.) Pennsylvania.

Phlox depressa (A. Nels.) Rydb. Montana.

Phlox diapensioides Rydb. Montana.

Phlox diffusa Benth. Oregon, Utah, Washington.

Phlox glabrata (E. Nels.) A. Brand. Wyoming.

Phlox Hoodii Richards. Montana, Utah.

Phlox nana Nutt. New Mexico.

Phlox rigida Benth. Utah.

Phlox scleranthifolia Rydb. Nebraska.

Phlox subulata L. New Jersey.

3. OTHER OUTSTANDING SPECIES

Aecidium Polemonii Peck, Bot. Gaz. **4**: 230. 1879

This *Aecidium* which has been shown by Arthur[5] to be the aecial stage of *Uromyces acuminatus* was first described on *Polemonium reptans* from Iowa. It is now known that the same rust goes to species of *Collomia* and *Phlox* as well as to *Gilia* in all probability. This *Aecidium* is to be distinguished from the *Aecidium* of *Allodus Giliae* by its larger aeciospores which are 15–24 × 18–27 μ as contrasted with 13–19 × 14–22 μ, the size of aeciospores of *A. Giliae*. The walls of the peridial cells also appear to be regularly thicker in *A. Giliae* than in *Nigredo Polemonii*.

Puccinia Giliae Hark. Bull. Calif. Acad. Sci. **1**: 34. 1884

Harkness[6] described this rust which is usually ascribed to

[5] Arthur, J. C. Cultures of Uredineae in 1910. MYCOLOGIA **4**: 29. 1912.

[6] Harkness. New Species of California Fungi. Bull. Calif. Acad. Sci. **1**: 29–47. 1884.

Ellis & Harkness[7] whose combined paper appeared immediately preceding that of Harkness. The type was collected on leaves and subtending bracts of *Gilia ciliata*. Mt. Diablo, May. *2996*.

There appears to be no specimen in the Ellis collection and it seems probable that Harkness did not send Ellis any of this material. Prof. W. C. Blasdale has kindly visited the Herbarium of the California Academy and found one specimen which he takes to be the type. He says in his letter to Prof. H. S. Jackson (June 8, 1916): "The specimen consists of a single head of *Gilia ciliata* evidently collected after the plant had dried up." The packet bore the following data: *Puccinia Giliae* Hk. Gilia, dead stems, Antioch, June 17, 1882, *2996*. In commenting upon the discrepancy between this data and the published account Prof. Blasdale states further "although the published description gives Mt. Diablo as the type locality I think this specimen represents the type collection as Antioch is near the base of Mt. Diablo and Harkness was decidedly inaccurate in his data relating to his collections. The specimen bears a half dozen sori on the floral bracts."

My examination of a portion of this material sent by Prof. Blasdale shows smooth spores much thickened above (7–13 μ) and measuring 18–28 $\times$ 40–60 μ with pedicel up to 100 μ, rather persistent. It has been impossible to make a careful search for urediniospores with the limited material at hand, but in the one mount made a few appeared which seemed to correspond in every way with the rust which appears on several species of *Gilia* in California and adjacent states which when collected early bears abundant uredinia. The presence of urediniospores and the smooth teliospores conspicuously thickened at the apex makes this rust distinct from any others known on these hosts. It is known at present only from the Rocky Mountain region and the Pacific Coast.

Puccinia arabicola Ellis & Ev. Jour. Myc. **6**: 119. 1891

The type of this rust collected by Dr. Macoun and described as forming aecia and telia on *Arabis* sp., Ottawa, Canada, is in

[7] Ellis, J. B., and Harkness. New Californian Fungi. Bull. Calif. Acad. Sci. 1: 26–29. 1884.

the Ellis Herbarium at the New York Botanical Garden. It consists of a single, long-petioled orbicular leaf with six groups of aecia and about ten telia scattered over the under leaf surface. Holway reported that this rust varied in no way from the eastern specimens of *Puccinia plumbaria* Peck on *Phlox divaricata* and that the host was probably some species of *Phlox*. At the time of publishing my *Allodus* paper I had not examined carefully the aeciospores and peridial cells of the species. I have now critically studied it and believe it to be distinct from *Puccinia plumbaria* and I think the host must certainly be some cruciferous plant probably *Cardamine Douglasii* (Lam.) Britton as suggested by Dr. N. L. Britton, who has carefully examined and compared the type collection with phanerogamic collections. The aeciospores are considerably larger than those of *Puccinia plumbaria*.

STATE COLLEGE, PA.

THE MYCOLOGICAL WORK OF MOSES ASHLEY CURTIS

C. L. Shear and Neil E. Stevens

That America's first eminent mycologists were both clergymen, and both, though northern men by birth, became residents of North Carolina early in their careers is perhaps to be regarded as more than a coincidence (7, pp. 54). A century ago there were few professional botanists in this country and botanical work was carried on as an avocation by men of other callings, largely by physicians (13), and clergymen, while the state of North Carolina is unsurpassed in this country in the variety of its plant forms.

In the particulars cited, the life of Moses Ashley Curtis bears a strong resemblance to that of his great predecessor Lewis David de Schweinitz. In other aspects, however, they were strikingly different. Schweinitz was educated largely in Europe, began his botanical work there, and returned to Europe at least twice. At the age of forty-one, when his botanical work was well under way, he left the South and made his home in Pennsylvania. Curtis, on the other hand, was educated wholly in this country, appears never to have visited Europe, and spent most of his adult life in the Carolinas. His contact with foreign and most American botanists was chiefly through correspondence. The writers have already presented the available data on the life and work of Schweinitz (18), in the belief that the interpretation of his work by present day botanists would be thus facilitated. With a similar purpose, they have collected in the present paper such facts as are available regarding Curtis' mycological work.

The most complete sketch of the life of Moses Ashley Curtis is that published by Dr. Thomas F. Wood (21) who was a personal friend of Curtis. This contains a good portrait. Briefer sketches, one by Dudley (7), one by Scribner (17), and an unsigned one in Popular Science Monthly (22), probably written

by W. J. Youmans, then editor of that journal, are based largely on Wood's paper. An appreciation of Curtis' work, and outline of his activities by Asa Gray (11), which was originally published in the Proceedings of the American Academy of Arts and Sciences, was reprinted with only a slight verbal change in the American Journal of Science and later in the scientific papers of Asa Gray. In addition to the publications mentioned and others which will be cited, the writers have obtained considerable information from other sources.

By far the most important source of information regarding Curtis, to which the writers have had access, is the correspondence of the late Prof. Edward Tuckerman, Jr., of Amherst, Mass. This correspondence, fortunately preserved almost complete, and now the property of Tuckerman's nephew, Judge E. T. Esty, of Worcester, Mass., to whom the writers are greatly indebted for permission to use the material here presented, forms an exceptionally valuable source of information regarding the botanists of that time. The correspondence between Tuckerman and Curtis began about 1839 and extended to 1867. A packet of letters written by Curtis to E. C. Howe, of New York, covering the period 1866 to 1870, was kindly loaned to the writers by Mr. Stewart H. Burnham, of Hudson Falls, N. Y. Several letters from Curtis are in the collection of the Academy of Natural Sciences of Philadelphia, for the use of which the writers are indebted to the secretary, Dr. Edward J. Nolan. In addition to those above mentioned, the writers have been furnished valuable information by Prof. Elmer A. Green, Registrar of Williams College, Curtis' son, the Rev. Charles J. Curtis, of Accokeek, Maryland, and Dr. W. G. Farlow, of Harvard University.

SKETCH OF CURTIS' LIFE

Moses Ashley Curtis was born May 11, 1808, at Stockbridge, Mass. His father was the Rev. Jared Curtis, then of Stockbridge but later, for many years chaplain of the State prison at Charlestown.[1] His mother was a daughter of Gen. Moses Ashley. He

[1] The reference to Curtis having been born in Charlestown, found in The Letters of Asa Gray (12, Vol. 2, p. 652, footnote), is evidently a mistake, due to the fact that his father was for a long time a resident of that city.

prepared for Williams College largely under the tuition of his father, who kept a school in Stockbridge.[2] Curtis' cousin, Mark Hopkins,[3] also received a part of his early training from Jared Curtis.

Curtis graduated from Williams College in 1827. Three years afterward (October, 1830, 21, p. 10) he went to Wilmington, N. C., as tutor in the family of Governor Dudley. In 1833 (21, p. 15), he returned to Charlestown, Mass., for a year and a half, where he prepared his first botanical paper and began his studies for the ministry. He married Miss Mary de Rosset of Wilmington, December 3, 1834, and was ordained in the Episcopal Church in 1835, and at once took up missionary work in western North Carolina, with headquarters at Lincolnton. From early in 1837 to May, 1839, he was engaged as a teacher in the Episcopal School at Raleigh. The summer of 1839 was spent in the mountain country largely for his health, but that he used this time to good botanical purpose is evidenced by the testimony of Asa Gray (10, p. 12), that "no living botanist is so well acquainted with the vegetation of the Southern Alleghany Mountains . . . as the Reverend M. A. Curtis." Early in 1840 (21, p. 16) he was called to mission work about Washington, N. C., and early in 1841, removed to Hillsboro. Here, with the exception of nine years (1847–1856) spent at Society Hill, South Carolina, he resided until his death in 1872.

EARLY BOTANICAL WORK

Both Gray (11) and Dudley (7) note that Curtis' attention must have been early directed to botany, and in the letter transmitting the manuscript of his "Woody Plants of North Carolina" (5) to Dr. Ebenezer Emmons, then state geologist, Curtis writes as follows (5, p. 6):

> "I will state in conclusion, what you were not before aware of, that this Report is one of the fruits of your long continued service in the field of Science. My first knowledge of the elementary forms of Botany was derived from

[2] Information in a personal letter from Rev. Charles J. Curtis.

[3] Born at Stockbridge, Mass., February 4, 1802, eldest son of Archibald Hopkins and Mary Curtis.

yourself and your distinguished Preceptor, Prof. Eaton, at the beginning of your public career. Though I was then too young to be admitted to your course of instruction, an impulse was then given which never abated, and now, forty years afterward, returns back to you with this humble offering. The contribution is, therefore, most appropriately put in your hands by

Your friend and servant,
M. A. CURTIS."

The significance of this reference is apparent when it is recalled that in 1817 Amos Eaton (8) after two years at Yale chiefly under the tuition of Silliman, returned to Williams College, from which he had graduated in 1799, and there offered courses in geology and botany. As far as the writers have been able to determine, Eaton was not a member of the faculty, but with the enthusiastic approval of the faculty gave his courses to such students as chose to take them and among these students was Emmons.

Encouraged by the success of his work at Williams, Eaton gave courses of popular lectures on botany at various places in New England and New York. Prof. A. Hopkins (brother of Mark Hopkins) gives a striking description of Eaton[4] and his methods and refers to the fact that his "young pupil Emmons" was employed to collect plants for the demonstrations which accompanied the lectures. It is highly probable that the lecture so vividly described by Hopkins was delivered in his home town of Stockbridge and that Curtis, then nine years of age, may have attended the lecture. "The course of Instruction," to which Curtis refers, may have been that given in the nearby Lenox Academy in the spring of 1819 (8, p. 361). At any rate, as his own letter testifies, Curtis received his earliest botanical inspiration from the vigorous popular lecturer who had earlier encouraged Torrey (13, p. 136), and whose "Manual of Botany" was Asa Gray's first botanical text.

[4] Durfee (8, p. 360) gives a good biographical notice of Amos Eaton, which is copied by Nason (16) and used as a basis of the sketch published in Popular Science Monthly. There is also a good life of Eaton by Harlan H. Ballard in Collections of the Berkshire Historical and Scientific Society, pp. 185–234, 1897, and a sketch of his geological work in Merrill (15).

Curtis' first botanical paper was "Enumeration of Plants Growing Spontaneously Around Wilmington, North Carolina, with Remarks on Some New and Obscure Species." In this paper, which was prepared after only two years' residence in North Carolina, the author's powers of observation and aptitude for research are, according to Gray (11, p. 472), well shown. It is probable that much of Curtis' time while in college and during the three years succeeding his graduation, about which we have no record, was spent in botanical exploration in the Berkshires.

MYCOLOGICAL WORK

While Curtis never lost his interest in flowering plants, it was in mycology that his most notable work was done and it is as a mycologist that he is chiefly known. That Curtis was early interested in cryptogams and in touch with the literature on the subject is evidenced by his first letter to Tuckerman:

RALEIGH, N. C.
Feb. 18th, 1839.

Dear Sir:—

I was much gratified this day by the rec't of your "Enumeration of some Lichenes of N. England". Accept my thanks for your favor with an assurance that I am much pleased with every attempt to elucidate the Cryptogamia of our country . . . I am the more interested in your attempt because I hope to receive some advantage from it when I come to take up that order more systematically than I have yet done. I have hitherto worked upon it very unsatisfactorily and much at random, for want of suitable help. The libraries of this State afford me no encouragement and I cannot supply myself with books. I repeat then, that I hope you will go on in your effort.

. . . . . .

I think you would find much scope for interesting investigation among the Algae and Hepatic Mosses. The latter have received considerable attention from Schweinitz but the former have been entirely neglected as far as I know. (I can send you a copy of Schweinitz's Hepaticae if you do not own it.)

According to Wood, Curtis was in correspondence with Torrey as early as 1833 (21, p. 15) and met Ravenel in 1835. By 1840 he was carrying on a correspondence and exchange of specimens with Darlington and others and had accumulated an herbarium.[5] His correspondence was, however, confined to America,[6] and even late as 1844 his letters are devoted chiefly to phanerogams.

In 1845 Tuckerman seems to have given definite stimulus to Curtis' interest in cryptogams by requesting his assistance in collecting lichens, to which Curtis replies enthusiastically as follows:

HILLSBOROUGH, N. C., Nov. 7, 45.

Dear Sir:

Your letter reached me today, and I give an early answer as you desire. Your request, particularly when I consider the ground & purpose of it, has certainly my "sympathy", but I cannot now say how much you may expect from my "cooperation". I have several times thought I would take up the Lichens, & once made a small collection in the Low Country of this State, but the difficulty of studying *without* books embarrassed my progress & damped my zeal pretty effectually. Consequently I have now little on hand.

I am desirous of seeing a *complete* N. A. Flora, & am therefore glad that your attention is directed to a department which, if left to Torrey or Gray, would, I suppose, get a go-by. And I am willing to do what I can to help you on in the work, but my ability will not perhaps go to the extent of your wishes & need. I am at present in a region not abundant in interesting vegetable forms. It is probably in the swamps of the low country that peculiar forms of Lichens would be found, where the soil, climate, & elevation, are so different from the N. States. The middle region of the South is not so much unlike the North, & has much more of the Northern Flora. Besides, my present habitat has the precise features of that occupied by Schweinitz, when a resident of this State. It is not likely therefore that I should procure anything here which he has not already furnished Fries with. Nevertheless, I am disposed to try, & if leisure & health permit I will endeavor to collect something this winter for you. Without practice in this line, & with hardly any knowledge of species, it is not unlikely that I shall

[5] Letter to Tuckerman dated Portsmouth, N. C., Sept. 7, 1840.

[6] Letter to Tuckerman dated Washington, N. C., Feb. 11, 1841.

overlook many things, or perhaps even mistake a diseased excrescence for a Lichen.

Only eight days later he writes Tuckerman again.

HILLSBOROUGH, N. C., Nov. 15th /45

Dear Sir:

You will hardly expect from my last letter that I should commence work in your service so promptly as this. Nevertheless, I have nearly every day since been making some accumulations. What with my wood-pile, & the trees and old rails & posts on my premises, I have already got a small box full of specimens of something. Today I have taken a walk to some small wooded heights in the vicinity, here honored with the name of mountains, where I observed much more than I could bring home, upon the Trees, Rocks, & Earth.

I am met at the outset with what may be a serious annoyance to you. As I do not know a single species with certainty, & my ignorance is a hindrance to memory, I cannot tell at any time what I may have gathered before. And thus I may possibly send you scores of specimens, & not a score of species. I am also afraid to make a comparison of specimens from different localities & different species of trees for the purpose of throwing out a redundance of duplicates, for fear that I might overlook some slight differences which in your eye would be of essential interest, I find I need some training in order to serve you efficiently. To this end, it occurs to me that after all I had better have a set from you as a guide. By some study of it, I could in a little while get some general knowledge of Genera, & learn some of the distinctions of species. This would give important practice to the eye. From your letter to me, I judge that you have sets to spare. If therefore you will let me have one, as complete as you can spare, even as a *loan*, it will facilitate my progress very much, & probably save you the trouble of examining much trash.

I observe on the rocks—of which there is no lack here any more than in the country about Boston—many peculiar & pretty forms of crustaceous Lichens which I can devise no means of obtaining. What is the process? Let me know about this; & if they can be got off you shall have some.

I wish to see your specimens also, in order to know what sort of things to make. I have thus far chipped from trees small bits & strips of bark which do not include the whole thallus, though I intend they shall always show its margin.

Specimens from you will be of service in this respect. Suppose I send you a few in a pamphlet? I could send in this way large quantities, if you will endure the postage on them. —Shall I send a box for you at once?—& risk the wintry sea between Petersburg & N. York? Or, shall I wait till Spring and send a larger collection?

It is not unlikely that this work will excite sufficient interest in the subject to induce a desire of having a collection of Lichens; & possibly of making them a study. If so, I shall desire that a specimen of whatever I send you may be returned with a name. But of this more hereafter.

Respectfully,

M. A. CURTIS.

A month later he refers to an earlier attempt to study lichens, letter dated Hillsborough, N. C., Dec. 16th/45.

Every load of wood is overhauled as it comes to my yard, & no stick goes upon my fire that is not faithfully examined. I think I must have five or six hundred or more species, & representing twenty or more genera.

. . . . . .

Some years ago, when I started in this direction I was met by the same difficulty, & quit in despair, sending a part of my collection to Torrey (which I presume he threw away), & neglecting most of the remainder, I started at that time with some earnestness, &, if I could have then had a little assistance from a good Lichenist & some books, I should have been by this time somewhat au fait in this department.

My zeal in reviving again somewhat, & if I receive sufficient aid & encouragement from you, I shall probably go on with some vigor.

. . . . . .

Whenever good specimens of Fungi have presented themselves in my search for Lichens, I have enclosed some for Fries.

. . . . . .

I hope you will work up the N. A. Lichens. Just give me prestige enough, & I will see that those of Carolina are looked after. Furnish the stimulus, & I shall keep going, I reckon. My hands are sore cutting off bark,—blistered and torn.

Truly yours,

M. A. CURTIS.

A letter written January 8, 1846, shows that shipping specimens by freight proved too slow for Curtis' growing impatience and contains his first reference to a serious study of fungi, to which he has already given some attention.

HILLSBOROUGH, N. C. Jan: 8th/46

Dear Sir:

You solicited my assistance in collecting Lichens with a fear, no doubt, that I might decline the service on account of being too troublesome to me. There is now some danger that the most trouble will be in the other direction. I am getting impatient to know some of these Lichens—all of them indeed—but I can be kept somewhat comfortable by learning a few at a time. There will be progress—& that is what I wish to realize. With your permission then, I will occasionally, till my box reaches you, send a few specimens by letter that you may give me the names. I will not trouble you to write letters in reply, but merely to send a sheet containing the names of the plants, if you can do it without too much labor or annoyance.

. . . . . .

I have taken out from the collection such Fungi as I could readily lay hands on. Some probably remain, which you can throw into the fire. But I will be obliged to you to communicate my proposal to Fries. I shall be glad to know something of this Order. How can I get a copy of Schweinitz Synopsis Fungorum?

I have several times attempted the Fungi, but with small means have made small progress. The Musci (frondosi) hurt my eyes too much, & I quit them long ago. But the Musci Hepatici I still dabble at. Can you send me any of these?

At this time (1846) it was evidently his plan to depend upon Fries for assistance in the identification of fungi.[7]

On April 27, 1846, he states that he has secured copies of Schweinitz's "Synopsis N. C. Fungi," and also the "U. S. Fungi."

There is a break of over a year in the correspondence between Tuckerman and Curtis (1846–1847). During this time Curtis began correspondence with Rev. M. J. Berkeley which effectively

[7] Letters to Tuckerman dated Hillsborough, N. C., April 13, /46, and April 27, /46.

fixed his attention on fungi. Early in 1848, he writes Tuckerman as follows:

SOCIETY HILL, S. CAR., Jan: 17th 1848

Dear Sir:

Yours of the 3d inst: reached me today, forwarded from Hillsborough, N. Car;—I removed here last April.

Since I last heard from you I have devoted my researches chiefly to Fungi—though I do not neglect the Lichens. For some time I continued to collect the latter very vigorously, but gradually became more fond of the former, until they have come to absorb pretty much all my attention.

That his study of fungi had been productive is evidenced by the publication in November, 1848, of his first mycological paper. In the introduction to this paper, Curtis gives a résumé of early mycological work in America and concludes as follows (4, p. 351):

> At present I do not know that any American botanist is giving this obscure but interesting order any special attention, except H. W. Ravenal, Esq., of South Carolina, and myself.
>
> In the present paper are enumerated two decades of Fungi not before included in any American publication, and one of new species. They are taken at random from lists of several hundred, which will be published from time to time hereafter. To acknowledge a heavy debt of obligation, and to insure to the following list an authority which I could not myself give it, I must here state that nearly all the species have passed under the eye of my very attentive and generous correspondent, Mr. Berkeley.

JOINT WORK WITH BERKELEY

The collaboration of Berkeley and Curtis to which the paragraphs just quoted are the first published reference, was not only profitable to both correspondents concerned but most advantageous to the progress of mycology, especially in America. That Curtis transmitted to Berkeley not only his own collections but fungi sent him by various American correspondents, notably, Ravenel, Michener, Peters, Sprague, Wright, Murray, Russell, Blake, Morse, and Sartwell, is evident from published references

(1). Some idea of the extent of Curtis' work is gained from the sentence with which Berkeley concludes the introductory paragraph to the first of the series of "Notices of North American Fungi," which appeared in Grevillea (1, p. 33).

> "Cyphers following the descriptive characters are those of an enormous mass of Fungi amounting to more than 6,000 numbers forwarded to me from time to time by the late Doctor Curtis."

Berkeley's letters sent to Curtis have been lost or destroyed, since according to the Curtis heirs, none are to be found among his correspondence and Dr. Farlow informs the writers that they are not with the Curtis collection of fungi at Harvard. The Berkeley correspondence which is in the British Museum contains, however, many letters from Curtis, the first of which, according to information kindly furnished by Miss Elsie M. Wakefield of the Royal Botanic Gardens, Kew, is dated April 17, 1846, and the last, March 12, 1872. With Berkeley's Herbarium at Kew are two small volumes containing the manuscript lists with notes and comments on the Carolina fungi[8] which Curtis sent to Berkeley with the specimens. A copy of this manuscript is in the library of the New York Botanical Garden. With the Curtis collections at Harvard are lists of several thousand numbers of the specimens sent to Berkeley with the corresponding numbers of the original collections. These are apparently copies which Curtis kept for his own reference.

To publish a complete bibliography of Berkeley and Curtis' work would be needless duplication of the excellent list given by Farlow and Trelease (9). It should be noted, however, that the series of papers under the title of "North American Fungi," beginning in 1872, were published by Mr. Berkeley after Curtis' death. These contained many species attributed to Berkeley and Curtis, based in part on manuscript notes furnished by Curtis with the collections. This series alone lists 1,005 species of American fungi. Curtis' contribution to this joint work was much more than that of a mere collection, as is plainly evidenced by the fact that the specimens he sent Berkeley were accompanied by

[8] Personal letter from Miss Wakefield dated Nov. 5, 1916.

manuscript lists of the specimens sent, together with notes and comments. It is therefore appropriate that even after Curtis' death, Berkeley published many of the new species under their joint authorship.

STUDY OF THE SCHWEINITZ COLLECTION

Perhaps the most important single piece of work undertaken jointly by Berkeley and Curtis was their study of the Schweinitz collection of fungi. Through the courtesy of Miss E. M. Wakefield in examining Curtis' letters to Berkeley now preserved at the British Museum, the writers were able to publish some account (18, p. 334–7) of the way in which this work was done. From this, it appears that Curtis spent 17 days, during the summer of 1851, in the study of the fungi in the Schweinitz Herbarium. There is a letter to Tuckerman dated "Phila. July 22nd, '51," which may very probably have been written during the time Curtis was engaged in this work. On the promise, apparently, of additional specimens for the herbarium (19, p. 555), (18, p. 335) and of "a critical review of the fungi" (18, p. 336), he was permitted to take a specimen from the collection when there were more than two of any species. Whenever the fragment which he took from the Schweinitz herbarium was large enough he divided it and sent a part to Berkeley, also in some cases a portion to Fries. Curtis was thus able to send to Berkeley nearly fifteen hundred specimens to keep, and later over three hundred which were to be returned when done with, as they could not be divided.

Of the promised "critical review" only one installment was published, this appeared in July, 1856, when as stated in the introduction "about one fourth of the species" had been reviewed. Much more of the material must have been critically examined later, however, as in Berkeley's personal copy of Schweinitz "Synopsis Fungorum in America Boreali" now in the library of the U. S. Department of Agriculture (see 18, p. 338) species are checked and sketches of spores occur throughout the book. Dr. Farlow writes in a personal letter dated Nov. 18, 1917, that in Curtis' copy of Schweinitz work, now in his possession, many of

the species are checked, evidently with the intention of indicating whether or not Curtis actually saw the specimens in the Schweinitz herbarium.

Regarding the preparation of the joint paper referred to above, the writers have found no correspondence. There are however in the files of the Philadelphia Academy of Natural Sciences several letters from Curtis which indicate that he prepared the material for the press, and corrected the proof. Portions of these letters which were probably written to Dr. Zantzinger, then secretary of the Academy and which are self explanatory, are published below.

SOCIETY HILL, S. CAR. Jan: 17th, '53.

Dear Sir:

There is now nearly ready a paper upon the Exotic Fungi of Herb. Schwein: which he never published. Mr. Berkeley thought it best to begin with these, as being material mostly new. The notice of his American species will follow in time, as we can reduce the materials. The task is more difficult than I had anticipated.

. . . . . .

Please inform me then, *when* you will be ready to publish this paper;—whether in quarto or octavo size;—& in regard to proofs, whether you allow us any copies, & how many.

SOCIETY HILL, S. CAR. Feb. 1st, 1853.

Dear Sir:

Your favor is received.—The paper on the Schweinitzian Fungi is not quite completed, but I hope to be able to forward it in four or five days.—In the meantime I send you the drawings by Mr. Berkeley sufficient for one Plate. It is doubtful if I shall have enough for another Plate. If not, there will be no more sent.

. . . . . .

I will be obliged to you for proofs of the Plate and Letter Press.—Your allowance of 20 copies to the Author is very liberal, & we will be obliged to you for them.—Please have 10 sent to me, & retain the others until I learn what disposition Mr. Berkeley will have me make of it.

With many thanks for your uniform courtesy, I remain, dear sir,

Very respectfully & truly yours,

M. A. CURTIS.

[This letter was addressed on the back to Dr. Zantzinger.]

SOCIETY HILL, S. C., Feb. 4th, 1853.

Dear Sir:

I herewith send manuscript.—The hand is a very awkward and puerile one, but printers have generally thought it very legible. So I hope there will not be much trouble about correcting proofs.

I should like to have the names, immediately attached to each Number, in other words, each species named & described, to be printed in small caps or italics. I prefer the former. I leave this however to your judgment, & so have not underscored said names.

I ought to have suggested in my last, that the figures engraved should correspond in size with the drawings sent, though I hope your artist has already thought of that.—The explanation of figures on the last page of MSS now sent will show the reason of this.

I shall be glad to hear of the safe arrival of this, and the Drawings sent on the 1st inst.

Very truly yours,
M. A. CURTIS.

SOCIETY HILL, S. C., Feb. 21st, 1853.

Dear Sir:

I have your favor of the 15th, & am glad to learn that my two envois arrived safely.

I do not like to put my inferior drawings upon the same plate with Mr. Berkeley's, & I have not enough to make another Plate. I have therefore concluded not to send any.

Please remember to send me proofs, & much oblige,
Yours very truly,
M. A. CURTIS.

SOCIETY HILL, S. C. Apr. 5th, '53

Dear Sir:

By last mail I returned proofs of the 2nd instalment of the "Exotic Fungi."—If in altering the *Plate* (a matter about which I have no knowledge) there be much trouble, the slight correction of fig: 3, a, might be left unnoticed, as it is a matter of no great importance.—The correction in the names at the bottom of the page should be attended to.

. . . . . .

Very respectfully,
M. A. CURTIS.

P. S. Could Dr. Leidy send me by *Letter* specimens of some of the Microscopic Fungi observed by him on animal tissues? I should like to examine them.

SOCIETY HILL, S. CAR Apr. 16th, '53.

Dear Sir,

. . . . . .

Can you add the following note to our Article

Since the Article on Exotic Fungi was put to press it has been ascertained that Gnadenhutte is in Ohio; & that Bishop Hueffel, while visiting the Moravian Missions on the Danish W. India Islands in 1827, collected many plants.

This note can be altered to suit your taste, if you do not like the cut of it.

. . . . . .

Very respectfully,
M. A. CURTIS.

The footnote mentioned in this letter is to be found at the bottom of page 293 of the paper as published in the bound volume. It also occurs in the authors' separates which are dated April, 1853, instead of March as stated in the introduction to the volume, page 4.

While engaged in studying the fungi in the Schweinitz herbarium, Curtis urged Tuckerman to undertake a study of the lichens, advice which Tuckerman considered worth acting upon as is evidenced by his published works (18, p. 341).

Letter to Tuckerman.

SOCIETY HILL, S. C. March 4th '53.

. . . . . .

I am engaged with Mr. Berkeley in a critical review of the Fungi of Herb. Schwein. our paper (upon the exotic species) to appear probably in next No. of Trans. Philad. Acad.

Would you not serve a good end by a similar review of the Lichens of that collection?

. . . . . .

FLORA OF NORTH CAROLINA

That Curtis' interest in fungi never entirely replaced his interest in other plants is evidenced by his publication, as a part of the Geological and Natural History Survey of North Carolina, of

a catalogue of the plants of his adopted state. This was published in two parts, the first (5), a popular account of the trees, and shrubs, was issued in 1860, and the other, a catalogue of all the plants of the State, in 1867. The second portion was apparently nearly ready for the press when the Civil War broke out, but from letters to Tuckerman dated February 5, 1866, and February 23, 1866, it appears that some of the material was revised after the war. An account of some of the difficulties he encountered in securing publication after the war has been presented elsewhere (19). That it was published at all under such circumstances is evidence of the author's enthusiasm and persistence. As might be expected in a list of plants prepared by Curtis, the cryptogams find a larger place than was usual at that time. As acknowledged in the preface, the Musci and Hepaticae were identified by Sullivant, the Lichens by Tuckerman, while the fungi, probably all passed through Berkeley's hands.

Upon Emmons, the state geologist, who like Curtis was a native of Massachusetts but a resident of North Carolina for several years, the Civil War seems to have produced a profound and painful impression. He writes Marcou (14, p. 15): "I cannot but look with great fear upon the results of agitation. It unfits me for work." Whether or not Curtis shared this feeling can only be surmised. In Curtis' letters to Tuckerman, there is no hint of his personal attitude or opinions regarding the war. In his letter to Governor Jonathan Worth (6, p. 3), transmitting for publication that portion of his flora which had been delayed by the Civil War, Curtis refers to the delay as due to "more important matters of national interest that were then occupying the public mind."

The shortage of food in the south during the war (20 and 21) turned Curtis' attention to an intensive study of edible fungi. His success in securing food in this way induced him to prepare an illustrated manual of edible mushrooms designed for popular use, the manuscripts and plates of which were evidently finished with the assistance of his son, Rev. Charles J. Curtis, some time during the year 1865. The enormous cost of publishing such a work, especially in the decade immediately following the Civil War prevented its publication. This manuscript is still in the possession of the family.

LATER WORK

That Curtis' botanical work after the Civil War was materially hindered by the condition of his health is apparent from his letters. As early as 1866, he writes:[9]

> "Nos. 4 and 5 would require an amount of eye-work, for a satisfactory determination, which my present health will not permit. So I must leave them for better times."

This by no means indicates that he had lost any of his enthusiasm or interest in mycology. His letters at this time to Howe are full of instructions for collecting fungi and suggestions for their study, and are sometimes illustrated by sketches of spores and asci. On Feb. 7, 1867, he writes Howe:

> "Never mind about repeating the same things. Send anything that comes to hand. Your fire-wood will furnish much material during Winter, both in Lichens and Fungi."

On April 17, 1868, after a break of about three or four months in the correspondence with Howe, he writes:

> "I am still ready, if you desire it, to aid you, so far as I can, in working up the fungi of your region of country.
> "Since your last package was reported, I have determined several hundred species for C. F. Austin."

In July, 1868, he speaks of a contemplated trip for his health.[10]

> "I expect to leave home shortly for the Cumberland Mts. in Tenn. I hope a few weeks' relaxation will restore me to customary. If not, I shall have to relinquish microscopy."

The trip was partly successful and on November 20, 1868, he writes him again:

> "My health is improving, & I will work away at your Fungi, so far as I can without a resort to the Microscope;—a little at a time."

[9] Letter to E. C. Howe, dated Hillsborough, N. Car: Nov. 12, 1866.
[10] Letter to Howe dated Hillsborough, N. C., July 14th, 1868.

DISTRIBUTION OF CURTIS' SPECIMENS OF FUNGI

Berkeley was of course Curtis' most constant and most valued mycological correspondent and collaborator and to him duplicates of most of his collections of fungi as well as those from Michener,[11] Ravenel and others were sent. These are preserved in the herbarium of the Royal Botanic Garden, Kew, together with Curtis' manuscript lists, with his notes and comments of the fungi he sent to Berkeley. As suggested in the letters to Tuckerman printed above, and in letters to Berkeley published earlier (18, p. 335), Curtis sent many of his own collections as well as some duplicates of the fragments he took from the Schweinitz herbarium to Fries; all these are at Upsala. Among the American correspondents to whom Curtis sent specimens in exchange, Ravenel and Michener are known to have received large numbers of fungi. His correspondence with Ravenel began early (about 1835?) and continued until Curtis' death. In 1868, he wrote as follows concerning their relations:[12]

> "P. S. I enclose a few specimens lately sent for determination from Mr. Ravenel of S. C. He has a prior claim over all others, & the examination of his specimens has interfered somewhat with that of yours."

Ravenel's herbarium is now in the British Museum, and Michener's in the Pathological and Mycological Collections of the United States Department of Agriculture (19, p. 556). In 1857 Curtis presented to the Philadelphia Academy of Natural Sciences a collection of nearly eight hundred species of fungi. These were mounted by Doctor Michener (19, p. 555).

About two years before his death, which occurred on the 10th of April, 1872, Curtis determined to dispose of his duplicate specimens of fungi. Concerning this matter he writes Howe as follows:

[11] Curtis correspondence and exchange of fungi with Michener evidently began some time before 1855. Some fragments of it have already been published by the writers (18, pp. 548–49).

[12] Letter from Curtis to Howe dated Hillsborough, N. C., May 29, 1868.

HILLSBOROUGH, N. C. March 22/70.

Dear Sir:

I do not know whether or not I have mentioned my wretched state of health for a few months past. I have suffered dreadfully during the Winter with Neuralgia in my heart. For a few days I feel much better and hope I shall be myself again ere long.

It has lately occurred to me that perhaps I might dispose of my spare Fungi to some advantage to myself, & others. I have a large stock of duplicate specimens, which I would be glad to be rid of. It will be no small trouble to put them up, but if I can be properly remunerated I will undertake the labor.

Now do you know of any individual, or of any club or society, that will give me Fifty Dollars for a collection of Fungi that will be third in America as to quantity and value? My own is first, Schweinitz (in Acad. Nat. Sc. Phil[ae].) second.

I will guarantee 1500 species. There may be 2000 or more. I will not increase my price if there be more than 1500. I will diminish the price (in proportion) if there be less.

The collection will be particularly valuable, as being composed very largely of *authenticated* species, both of European & American authors.

As I am well advanced in life & not likely to do much more active service in Mycology, I would be glad to have my stock of specimens disposed of to best advantage before I quit the stage. It will be a tedious job, requiring months of time, to put up such specimens as I have; but I desire that they shall get into proper hands, where they may be useful & of standard authority, instead of being scattered here & there, or possibly lost entirely.

Let me know about this, if you think it likely my stock will be wanted.

I have lately come upon specimens of Corynites brevis, B & C, which will be of use to you if you get hold of that plant of which you sent me a sketch. I made no record of the thing, & forget what I called it, but believe it was C. brevis. (Of all your *numbered* specimens I keep a list.) I should be very glad to get specimens of your N. York species. Do try to get some this year.

Yours truly,

M. A. CURTIS.

How many of the sets of fungi were prepared is not known, but one appears to have been purchased by Peck and another by Bessey, whose herbaria are respectively in the New York State Museum at Albany and in the herbarium of the University of Nebraska at Lincoln.

After Curtis' death his own herbarium, containing hundreds of co-types of Berkeley and Curtis species, as well as portions of Schweinitz specimens, was purchased by Dr. Farlow and is now in the Cryptogamic herbarium at Harvard. Dr. Farlow writes:[13]

> "There are [with the Curtis herbarium] lists of several thousand numbers of the things sent to Berkeley with the corresponding numbers of the original collections so that there is no difficulty in recognizing the numbers quoted by Berkeley in Grevillea."

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BUREAU OF PLANT INDUSTRY,
WASHINGTON, D. C.

SMUTS AND RUSTS OF UTAH. III

A. O. Garrett

USTILAGINALES

4. Thecaphora deformans Dur. & Mont.

North American Flora (7[1]: 42. 1906) lists collections from Utah on *Astragalus missouriensis* Nutt. and on *Homalobus tenellus* (Pursh) Britton (*Astragalus multiflorus* A. Gray).

Professor Marcus E. Jones collected specimens on *Astragalus Thompsonae* Watson in a canyon above Tropic, Garfield Co., May 28, 1894, at an altitude of 1950 m.

9. Ustilago hypodytes (Schlecht.) Fries

In internodes of *Distichlis spicata* var. *stricta* (Torr.) Scribn.: *2272*, Aug. 24, 1914, West Fourteenth South St., Salt Lake City.

In internodes of *Elymus condensatus* Presl.: Collected by Wyatt W. Jones near Murray, Salt Lake Co., Sept., 1918.

North American Flora (7[1]: 5. 1906) lists a collection in Utah on *Stipa* sp.

12. Ustilago lorentziana Thüm.

In inflorescence of *Sitanion hystrix* (Nutt.) J. G. Smith: *2285*, June 16, 1915, near sand-dunes between Garfield and Saltair, Salt Lake Co. The host was determined by Mrs. Agnes Chase. No smut has previously been reported on this host. The smut was sent to Dr. Clinton, who writes, under date of October 20, 1915, "I am not sure whether the fungus represents a new species or not. It is close to *Ustilago Lorentziana* and *U. bromivora*. I have placed it provisionally under *U. Lorentziana* (?), but am not quite satisfied with that disposition."

13. Ustilago macrospora Desmaz.

In leaves of *Elymus canadensis* L., Salt Lake City, May, 1915.

A collection from Utah on *Agropyron* sp. is recorded in N. A. Flora (7[1]: 241–258. 1906).

14. USTILAGO STRIAEFORMIS (Westend.) Niessl.

A collection of this species from Utah on *Phleum pratense* L. is listed in North American Flora **7**[1]: 19. 1906.

UREDINALES

2. AECIDIUM TITHYMALI Arthur, Bull. Torrey Club **45**: 151. 1918

This rust was called *Aecidium Euphorbia* Pers. in the first paper on the "Smuts and Rusts of Utah." It has now been decided that the true *Aecidium Euphorbiae* does not occur in America. From field observations made at Cimarron, Colorado, the latter part of July, 1918, the writer feels confident that *A. Tithymali* is the aecial stage of *Uromyces occidentalis*. This was the only aecium found in the locality. Wherever it occurred, the Uromyces (on *Lupinus Greenei* A. Nels. ?) was very abundant. There was not one center of infection, but several, and they were several hundred yards apart. Moreover, the *Aecidium Tithymali* was for the most part too old to make good specimens, while the *Uromyces* was in prime condition.

4. PUCCINIA MONOICA (Peck) Arth. I

Aecidium monoicum Peck.

Another collection was made in the summer of 1915 of the *Aecidium* on *Sophia* sp. (since determined as *S. leptostylis* Rydb.), referred to in previous papers of this series (Mycologia **2**: 271. 1910, and Mycologia **6**: 241. 1914) as No. 4 (*Aecidium monoicum*). The collection in the summer of 1915 was made in Big Cottonwood Canyon not far from the place where the original collection was made.

On *Schoenocrambe linifolia* (Nutt.) Greene (*Sisymbrium linifolium* Nutt.). Collected by Professor Marcus E. Jones, May 25, 1908, at White River, Uinta Co., alt. 1800 m. (No. 7787 Jones.)

7. PUCCINIA ALTERNANS Arth. III

On *Bromus* sp.: *2292a*, July 12, 1915, near Silver Lake, Big Cottonwood Canyon, alt. about 2615 m. This was weathered

material, with an abundance of fresh aecia on the surrounding *Thalictrum* plants. The collections of aecia listed under the name of *Aecidium* sp. (No. 7 of this series of papers) belong to *Puccinia alternans.*

Dr. Arthur now considers *Puccinia alternans* to be a race of *Puccinia Agropyri* Ellis & Ev. (Mycologia **7**: 73–75. 1915).

9. GYMNOSPORANGIUM NELSONI. I

On *Peraphyllum ramosissimum* Nutt. Collected by Professor Marcus E. Jones (No. 6029), at Asays, Garfield Co., Sept. 11, 1894, alt. 2250 m.

15. MELAMPSORELLA ELATINA (Albert & Schw.) Arth.

Peridermium elatinum Schw. & Kze.

On *Abies* sp. Collected by Professor Marcus E. Jones at Strawberry Valley, August, 1883.

This rust forms large witches' brooms on the alpine fir (*Abies lasiocarpa*).

17. PHRAGMIDIUM IVESIAE Sydow, Ann. Myc. **1**: 329. 1903
Ph. affine Syd.

On *Potentilla glomerata* A. Nelson: *2345:* II, iii, July 24, 1917, Emigration Canyon, Salt Lake Co. Host determined by Dr. Rydberg. The host of the collection reported from the Hot Pots (No. *727*) given in the original paper as *Potentilla glomerata* has been determined by Dr. Rydberg[1] as *Potentilla dichroa* Rydb.

28. PUCCINIA BALSAMORRHIZAE Peck

Mr. Wyatt W. Jones, botanist of the American Smelter and Refining Company's Experiment Station, made a collection of rust in II and iii in Salt Lake Co., May 10, 1915, on *Balsamorrhiza hirsuta* Nutt., which is tentatively referred to this species.

34. PUCCINIA CINEREA Arthur. III

On *Puccinellia airoides* (Nutt.) Wats. & Coulter. Collected by Ellsworth Bethel, November 15, 1917, at Marysvale, Piute Co.

[1] Bull. Torrey Club, **37**: 490. 1910.

38. PUCCINIA COMANDRAE Peck. III

On *Comandra pallida* DC. Collected by E. M. Hall, July 14, 1918, in Zion Canyon, Washington Co.

45. PUCCINIA DOUGLASII Ellis & Ev.

On *Phlox* sp. Collected by Professor Marcus E. Jones (Jones 1695) at Gold Mountain, August 22, 1901.

48. PUCCINIA CYNOMARATHRI Holway, North American Uredineae 1: 94. 1913

This was listed in the first paper on the "Smuts and Rusts of Utah" as *Puccinia Ellisii* De Toni, but Professor Holway has described it as a distinct species in the publication cited above.

57. PUCCINIA HARKNESSII Vize

On *Stephanomeria* sp. A collection was made by Prof. Marcus E. Jones (No. 5241), May 16, 1894, at Springdale, Washington Co., alt. about 1200 m.

69. PUCCINIA JONESII Peck. I, III

On *Cogswellia lapidosa* (M. E. Jones) Rydb. (*Cymopterus lapidosus* Jones) I, collected by Professor Marcus E. Jones (Jones 7781), at Theodore, benches of the Uintas, Wasatch Co., May 12, 1908.

On *Cogswellia simplex* (S. Wats.) Rydb. (*C. platycarpa* (Torr.) Jones); *Lomatium platycarpum* (Torr.) Coulter & Rose. Collected by Professor Marcus E. Jones (Jones 1695), 1880. This collection is labeled "*Aecidium sublineatum* Pk. sp. nov." in Professor Jones' herbarium.

77. PUCCINIA MERTENSIAE Peck. III

On *Mertensia foliosa* A. Nels. Collected by Dr. J. F. Brenckle, May 7, 1918, at Red Butte, near Ft. Douglas, Salt Lake Co.

78. PUCCINIA MONARDELLAE Dudley & Thompson. I, II

On *Madronella oblongifolia* Rydb.: *2347*, August 24, 1917, Parley's Canyon, Wasatch Mts., Salt Lake Co. Collected by Garrett & Giddings.

81. PUCCINIA PIMPINELLAE (Str.) Mart. I, II

P. Osmorrhizae (Peck) Cooke & Peck.

On leaves of *Osmorrhiza occidentalis* Nutt.: *2257*, I, May 22, 1915, Red Butte Canyon, Wasatch Mts. *2254*, II, August 20, 1911, Abajo Mts., San Juan Co., alt. about 2000 m. Exsic. Fungi Utahenses *235*.

77 and 98. PUCCINIA MONTANENSIS Ellis

On *Elymus glaucus* Buckley. *2302*, III, Oct. 10, 1915, Red Butte Canyon, Salt Lake Co. Exsic. Fungi Utahenses *234*. The host was in a region where it had been surrounded by Hydrophyllum plants which had borne an abundance of aecia earlier in the year.

The specimens recorded in the first paper of "Smuts and Rusts of Utah" as No. 98: *Puccinia* sp. should be referred to *Puccinia montanensis*. It was suggested in the notes accompanying No. 98 that probably these collections (which sometimes have been called *Puccinia agropyrina* Ellis & Ev.) were connected with the Aecidium on the various species of Hydrophyllum. To test the correctness of this prediction (made in 1910), the writer sent to Dr. Arthur (on May 23, 1915) a fresh collection of aecia on *Hydrophyllum capitatum*, and requested that a sowing be made on Agropyron and Elymus. Dr. Arthur's inoculations were successful, uredinia beginning to show on Agropyron June 7, followed by telia June 11.

99. PUCCINIA ATRO-FUSCA (D. & T.) Holway

The rust designated under No. 99 of the "Smuts and Rusts of Utah" as *Puccinia* sp. should be referred to *Puccinia atro-fusca*.

Another collection was made at the same locality on August 24, 1917 (No. *2348*). Both collections were determined by Dr. Kern.

105. PUCCINIA SUBNITENS Dietel

On *Chenopodium murale* L. I, Collected May 6, 1918, at St. George, Washington Co., by E. M. Hall.

On *Atriplex rosea* L. (*A. spatiosa* A. Nelson) I. Collected July, 1916, at Oasis, Millard Co., by M. R. Porter.

The type collection of *Aecidium Sarcobati* Peck (which according to Dr. Arthur's cultures is one of the aecial forms of *P. subnitens*) was made by Professor Marcus E. Jones, June 23, 1880, at Milford, Beaver Co. Another collection was made by him (No. 7809), June 26, 1906, at Burbank, Millard Co. (alt. 1800 m.). Professor Bethel claims that this aecidium goes to *Puccinia luxuriosa* Sydow.

107. PUCCINIA SUBSTERILIS Ellis & Ev.

On *Eriocoma cuspidata* Nutt. (*Oryzopsis hymenoides* (R. & S.) Ricker): *2332*, Sept. 23, 1916, mouth of Red Butte Canyon, Salt Lake Co. This was formerly called *Uredo Eriocomae* Ellis. Altitude 1500 m. Exsic. Fungi Utahenses *240*.

124. PUCCINIASTRUM MYRTILLI (Schum.) Arth.

On *Vaccinium* sp. Collected by Professor Marcus E. Jones, August, 1883, in Strawberry Valley, Wasatch Mts.

On *Vaccinium globulare* Rydb. Collected by Dr. Hedgcock in Uinta Mts.

129. UROMYCES PUNCTATUS Schröt.

U. Astragali (Opiz.) Schröt.

On *Astragalus argophyllus* Nutt.: *2297*, July 22, 1915, Logan Canyon, Cache Co. (Host determined by Dr. Rydberg.)

131. UROMYCES INTRICATUS Cooke

U. Eriogoni Ellis & Hark.

On *Eriogonum ramosissimum* Eastw. Collected by Dr. P. A. Rydberg at Bluff, San Juan Co., August, 1911. Host determined by Dr. Rydberg.

132. UROMYCES PROEMINENS (DC.) Pass.

On *Euphorbia Greenei* Millsp.: *2402*, Duchesne, Duchesne Co., July 30, 1918. Host determined by Dr. Rydberg.

136. UROMYCES JUNCI-EFFUSI Sydow

This was listed as *Uromyces Junci* (Desm.) Lev. in the first paper of the "Smuts and Rusts of Utah," and was issued in

Fungi Utahenses under that name. *Uromyces Junci-effusi* has 3 or 4 germ-pores in the uredospores, while *U. Junci* has only 2.

143. UROMYCES ZYGADENI Peck

This species is listed in North American Flora (7^3: 241. 1912) as having been collected in Utah on *Zygadenus falcatus* Rydb.

The type of *Uromyces Zygadeni* was collected in City Creek Canyon, near Salt Lake City, by Professor Marcus E. Jones on *Zygadenus paniculatus.*

120. PUCCINIA WYETHIAE (Peck) Ellis & Ev.

A collection on *Wyethia arizonica* A. Gray was made by Professor Marcus E. Jones at Sink Valley, June 2, 1890.

123. PUCCINIASTRUM PUSTULATUM (Pers.) Dietel

On *Epilobium stramineum* Rydb.: *2363,* July 27, 1918, Witbeck's Ranch, near Vernal, Uinta Co.

148. COLEOSPORIUM RIBICOLA (Cooke & Ellis) Arth.

On *Ribes aureum* Pursh. Collected by Bethel & Hunt near Monticello, San Juan Co., August 15, 1918. The first record for the State on this host.

On *Grossularia inermis* (Rydb.) Cov. & Britt. Collected by Bethel & Hunt near Monticello, San Juan Co., August 15, 1918, the first record for the State on this host.

150. CRONARTIUM PYRIFORME (Peck) Hedgc. & Long. II, III *C. Comandrae* Peck.

On *Comandra pallida* A. DC.: II. Collected by Professor Marcus E. Jones, August, 1883, at Salt Lake City. In Professor Jones' herbarium this collection is labeled "Uredo Commandrae Peck n. sp."—a name that evidently was never published. III, *2401a,* July 26, 1918, near Vernal, Uinta Co., alt. about 1665 m.

The connection of *Cronartium Comandrae* with *Peridermium pyriforme* Peck was demonstrated by Hedgcock & Long.

152. GYMNOSPORANGIUM GRACILENS (Peck) Kern & Bethel. III *G. speciosum* Peck.

On *Juniperus utahensis* (Engelm.) Lemm.: *2360*, Witbeck's Ranch, near Vernal, Uinta Co., July 27, 1918.

157. PUCCINIA ACTINELLAE (Webb) Syd. I

On *Actinella scaposa* Nutt. Collected by Professor Marcus E. Jones (No. 5290) at Cisco, Grand Co.

163. PUCCINIA GLOBOSIPES Peck

On *Lycium Andersoni* A. Gray: *2305*, June 11, 1915, Hat Island, Great Salt Lake. Host determined by Dr. Rydberg.

On *Lycium Torreyi* A. Gray. Collected by E. M. Hall at North St. George, Washington Co., May 17, 1918.

170. PUCCINIA PSEUDOCYMOPTERI Holw.

Mentioned in N. A. Uredineae (1: 91. 1913) as having been collected in Utah on *Pseudocymopterus anisatus* C. & R.

174. PUCCINIA TUMIDIPES Peck

On *Lycium pallidum* Miers. Collected by Dr. P. A. Rydberg, August 26, 1911, Cottonwood Creek, one mile northeast of Bluff, San Juan Co.; and by E. M. Hall, November 9, 1916, at Big Plains, Washington Co.

176. PUCCINIA VARIOLANS Hark.

On *Tetradymia canescens* DC. Collected by Professor Marcus E. Jones July, 1886, at Rockford.

On *Tetradymia comosa* A. Gray. Collected by Professor Marcus E. Jones May 16, 1915, at Temple Wash.

182. UROMYCES PSORALEAE Peck

The type of this species was collected by Professor Marcus E. Jones on *Psoralea* sp., June 4, 1880, alt. 1,300 m. Although stated in the original description as having been collected at Salt Lake City, Professor Jones tells me that it was collected "toward Garfield."

Mr. Wyatt W. Jones made a collection of this species in the aecial stage in Weber County.

184*. AECIDIUM ALLENII Clinton, Ann. Report N. Y. Museum **24**: 93. 1872[2]

On leaves of *Shepherdia canadensis* Nutt. (*Lepargyraea canadensis* (L.) Greene): *2319*, August 21, 1916, Daniel's Canyon (above old millsite), Wasatch Co., alt. about 2,200 m. This is apparently the first record of this rust in the State. Exsic. Fungi Utahenses *226*.

Mr. Bethel connects this *Aecidium* with a coronate *Puccinia* on *Elymus* and *Agropyron*.

185*. AECIDIUM BIFORME Peck, Am. Nat. **9**: 351. 1875

Collected in May, 1874, at St. George, Virgin Valley, Washington Co., by Dr. C. C. Parry. Bethel refers this to *Puccinia subnitens*.

186*. AECIDIUM LEPIDII Tracy & Gall., Jour. Mycol. **4**: 21. 1888

Collected by Tracy & Galloway, July, 1887, type, on *Lepidium montanum* Nutt. Bethel refers this to *Puccinia subnitens*.

187*. CRONARTIUM OCCIDENTALE Hedg., Bethel & Hunt. I, II, III, Jour. Agr. Research **14**: 413. 1918

On *Pinus edulis* Engelm.: F. P. 29419, I (*Peridermium occidentale* Hedg., Bethel & Hunt), McKee's Ranch, 15 miles northeast of Vernal, Uinta Co., July 28, 1918. This is the first record of the collection of the *Peridermium* in the State. Hunt and Bethel collected it at Monticello, San Juan County, on August 15, 1918.

On *Ribes aureum* Pursh. *2948*, II, III, September 14, 1918, Santaquin, Utah Co., alt. about 1428 m. The first collection in Utah of the *Cronartium* was made at Santaquin, September 19, 1914, by Professor C. P. Taylor on this same host.

On *Ribes odoratum* Wendl. (*R. longiflorum* Nutt.) III. Collected by Professor E. M. Hall at Springdale, Washington Co., November 10, 1916.

[2] Numbers marked with the asterisk (*) are those of species not included in either of the two preceding lists.

On *Grossularia inermis* (Rydb.) Cov. & Britt. (*Ribes inerme* Rydb.) II, III. Collected by Bethel & Hunt at Monticello, San Juan Co., August 15, 1918. This is the first collection on this host in the State, and the second in nature on this host.

188*. GYMNOSPORANGIUM BETHELI Kern. I, III, Bull. Torrey Bot. Club **34**: 459. 1907.

On leaves and sparingly on fruits of *Crataegus rivularis* Nutt.: *2293*, July 22, 1915, Logan Canyon, Cache Co. Exsic. Fungi Utahensis *227*. Also reported by Dr. O'Gara on the same host from Parley's Canyon, Salt Lake Co.

On *Juniperus scopulorum* Sarg. Collected by Professor Ellsworth Bethel, November 11, 1917, at Gilluly Station (Tucker P. O.), Utah Co. Even at the late date on which this collection was made, a few telial horns still persisted.

189. GYMNOSPORANGIUM JUVENESCENS Kern. III, Bull. N. Y. Bot. Garden **7**: 448. 1911

On *Juniperus scopulorum* Sarg. Collected by Professor Ellsworth Bethel, November 17, 1917, in Bullion Canyon near Marysvale, Piute Co. This species forms large witches' brooms on the cedar trees. The leaves in the fasciations become slender and sharp-pointed like those of the young growth. The aecia are found on *Amelanchier*, but have not yet been reported from Utah.

190*. GYMNOSPORANGIUM KERNIANUM Bethel. III, Mycologia **3**: 157. 1911

On *Juniperus utahensis* (Engelm.) Lemm.: *2361*, July 27. 1918, Witbeck's Ranch, near Vernal, Uinta Co. Also collected by Professor Ellsworth Bethel, November 17, 1917, on the same host, in Bullion Canyon (three miles from Marysvale), Piute Co. This collection consists of only the fasciations made by the rust. These fasciations can be distinguished from those of *G. juvenescens* by the fact that the scales are altered only by becoming smaller instead of reverting to the sharp-pointed form of the younger growth, as they do in *G. juvenescens*.

191*. MELAMPSOROPSIS ARCTOSTAPHYLI (Dietel) Arthur. 11

Chrysomyxa Arctostaphyli Dietel. Result. Sci. Congr. Bot. Vienne 338. 1906.

On *Arctostaphylos Uva-Ursae* (L.) Spreng. Collected by Professor Marcus E. Jones, August 2, 1894, at Fish Lake, Sevier Co., alt. about 3000 m.

This is a very rare rust, the other collections being two from Wisconsin, one from Colorado and one from Montana. The aecial connection is still to be discovered, and is to be looked for on the leaves and cones of the spruces.

192*. PERIDERMIUM COLORADENSE (Dietel) Arthur & Kern, Bull. Torrey Bot. Club **33**: 426. 1906.

Dr. Hedgcock states (Phytopathology **3**: 17. 1913) that many spruce trees diseased by this fungus were observed in the Manti National Forest. *Picea Engelmanni* is more often attacked than *Picea lasiocarpa*. Diseased trees can easily be told by the conspicuous witches' brooms made by the fungus.

193*. PUCCINIA ANOMALA Rost. Thüm. Flora **1877**: 92. 1877 *P. Hordei* Otth.

In his Uredinales of Oregon (page 231), Dr. Jackson states that specimens of this rust from Utah, on the leaves of the wild barleys, are in the Arthur herbarium.

194*. PUCCINIA CHRYSANTHEMI Roze. II, Bull. Soc. Mycol. de France **16**: 92. 1900.

On leaves of *Chrysanthemum* sp. cult. Collected November, 1915, at Salt Lake City, by Kenneth Robbins, a pupil in Botany at the Salt Lake High School.

195*. PUCCINIA COLLINSIAE P. Henn. I, Hedwigia **37**: 269. 1898

On *Collinsia parviflora* Dougl. Collected May 29, 1917, at Plain City, near the Hot Springs above Ogden, Weber Co., by Wyatt W. Jones, botanist of the American Smelter and Refining

Company's Experiment Station. A specimen of this collection was sent to Dr. Arthur for determination, and he puts it here provisionally.

196*. PUCCINIA CONSIMILIS Ellis & Ev. I, Jour. Myc. **6**: 120. 1891

On leaves of *Sisymbrium incisum* Engelm. Collected by Professor Marcus E. Jones (No. 7788), at White River, Uinta Co., May 25, 1908, at an altitude of 1800 m.

197*. PUCCINIA GENTIANAE (Strauss) Link. II, III, Willd. Sp. Pl. 6^2: 73. 1825

On *Gentiana affinis* Griseb.: *2307*, August 9, 1916, Barclay Station, Parley's Canyon, Salt Lake Co., alt. 1860 m. Collected by Garrett & Giddings. (Exsic. Fungi Utahenses *231*.) Also collected on this same host by Professor Marcus E. Jones (No. 2163), August 15, 1881, at Park City, Summit Co., alt. 2400 m.

On *Gentiana Amarella* L. II, III. Collected by Professor Marcus E. Jones (No. 5913), August 27, 1894, at Marysvale, Piute Co., alt. 1950 m.

198*. PUCCINIA GLUMARUM (Schmidt) Ericks. & Henn. II, Zeits. Pflanzenkr. **4**: 197. 1894

Two collections recorded under No. 93 of this list (Mycologia **2**: 293. 1910) as *Puccinia rubigo-vera* (Nos. *1010* on *Elymus glaucus* Buckl. and *2038* on *Hordeum jubatum* L.) should be referred to this species, as determined by Dr. H. B. Humphrey in Phytopathology **7**: 143. 1917. These two collections were distributed in Fungi Utahenses under the numbers 138 and 191 respectively. Another collection also distributed in Fungi Utahenses (No. 192) as *P. rubigo-vera* was determined by Dr. Humphrey at the same time as referable to this species. This collection should be recorded as follows: On *Hordeum pusillum* Nutt.: *2083*, August 26, 1909, Parley's Park, Parley's Canyon, Salt Lake Co.

Dr. O'Gara has reported in Science N. S. **44**: 610. 1916, the

occurrence of this rust in wheat fields north and west of Ogden.

The aecial stage of this rust has never been discovered.

199*. PUCCINIA LUXURIOSA Sydow. III, Monog. Ured. **1**: 812. 1904

On *Sporobolus airoides* Torr. Collected by Ellsworth Bethel, Nov. 15, 1917, at Marysvale, Piute Co. According to Professor Bethel, the aecial stage of this rust is found on *Sarcobatus vermiculatus*, given in this list as the aecial stage of *Puccinia subnitens*, No. 105. (Mycologia **6**: 245. 1914.)

200*. PUCCINIA OENOTHERAE Vize, Grev. **5**: 109. 1877

On leaves of *Sphaerostigma Utahense* Small: 2304, June 11, 1916, Carrington Island, Great Salt Lake, Tooele Co., alt. 1265 m.

Not before reported on this host.

201*. PUCCINIA PATRUELIS Arthur. II. Mycol. **1**: 245. 1909

On *Carex* sp.: *2168*, July 12, 1911, Gold Basin, La Sal Mts., San Juan Co., alt. about 2878 m.

In his Uredinales of Oregon, Dr. Jackson uses the combination *Puccinia hieraciata* (Schw.). Jackson for this rust.

202*. PUCCINIA SWERTIAE Wint. I, Rabh. Krypt. Fl. **1**: 205. 1881

On leaves of *Swertia Fritellaria* Rydb.: *2292*, July 13, 1915, west bank of Silver Lake, Big Cottonwood Canyon, Salt Lake Co. Alt. 2615 m. This is apparently the first recorded collection of this species on this host, as well as the first collection of the rust in the State.

EXSICCATI Fungi Utahenses *241*.

203*. UROMYCES FUSCATUS Arthur. I, ii, III, Bull. Torrey Club **45**: 142. 1918

On *Polygonum alpinum* All.: *2286*, June 29, 1915, mountainside south of Gogorza Station, Parley's Canyon, Summit Co. Alt. 1900 m.

EXSICCATI: Fungi Utahenses *244*.

204*. UROMYCES PROBUS Arthur. I, Bull. Torr. Club 38: 376. 1911

On *Sisyrinchium grandiflorum* Dougl.: Collected by Professor Marcus E. Jones, April 1, 1887, at Tooele, Tooele Co. This is labeled *Aecidium Sisyrinchi* in Professor Jones' herbarium, a name that apparently was never published.

205*. UROMYCES SOPHORAE Peck.

Professor Jones reports having collected this rust in southeastern Utah. I have not seen his specimens.

EAST HIGH SCHOOL,
SALT LAKE CITY, UTAH.

NOTES AND BRIEF ARTICLES

[*Unsigned notes are by the editor*]

Professor W. P. Fraser, formerly of Macdonald College, Province of Quebec, has been called to the University of Saskatchewan at Saskatoon.

Professor H. M. Fitzpatrick, of Cornell University, is engaged during the summer in field investigation of the potato wart disease for the Bureau of Plant Industry.

Nineteen new species of *Galerula* are described by Atkinson in the *Proceedings of the American Philosophical Society* **57**: 357–379. 1918.

The citrus diseases occurring commonly in Florida are treated by H. E. Stevens in Bulletin 150 of the Florida Experiment Station, which contains about 100 pages of text and 49 figures.

A new bacterial disease causing angular leaf-spot of tobacco was described by F. D. Fromme and T. J. Murray in the *Journal of Agricultural Research* for February 24, 1919.

Several new species of bacteria have been isolated from diseased portions of orchids by G. L. Pavarino, who publishes his discoveries in Atti Ist. Bot. Univ. Pavia **15**: 81–88. 1918.

Dr. J. C. Arthur publishes in the *Torrey Bulletin* for April, 1919, a number of new species of rusts, about 16 in all, from various parts of North America.

The fungous diseases attacking the persimmon in Japan are treated by T. Tanaka in the Mo. Bull. Cal. Com. Hort. **7**: 461–463. 1918.

Professor H. S. Jackson contributed a number of articles to recent volumes of the *Proceedings of the Indiana Academy of Sciences* on the Smuts and Rusts of Delaware and Indiana. These papers contain a great deal of valuable information.

An article on a wilt disease of maples, by L. A. Zimm, appeared in *Phytopathology* **8**: 80, 81. 1918. This disease is said to cause the young shoots of several common species of maples to lose their leaves and gradually die.

A descriptive list of the diseases of sugar-cane in tropical America, by J. R. Johnston and others, appeared in the *West Indian Bulletin* for 1918, pages 275 to 308. The list is a long and important one and what is there reported may be considered quite authoritative.

It is reported that because of the similarity of climate and soil conditions of Texas and the land upon which the Jewish "Republic of Judea" will be built, the Zionist Society has retained Dr. J. J. Taubenhaus, plant pathologist of the Texas Agricultural Experiment Station, for a high agricultural post in the new nation.

A list of unreported fungi for 1915 and 1916, by C. H. Kauffman, has appeared as a reprint from the 19th report of the Michigan Academy of Sciences. This list, which is quite a long one for certain families, has appended to it an index to the hosts and woody substrata of hymenomycetes in Michigan.

A text-book entitled "Applied Economic Botany," by Dr. Mel. T. Cook, has just appeared from the press of the J. B. Lippincott Company. In the 261 pages of text illustrated with 151 figures, there is a chapter on plant diseases which gives in very condensed and simple form some of the most important facts regarding this highly specialized subject.

An important paper on the Parasitism, Morphology, and Cytology of *Cronartium ribicola,* by R. H. Colley, appeared in the *Journal of Agricultural Research* for December 23, 1918. The article is illustrated with several halftones and many beautiful microscopic drawings.

In a paper on *Arcangeliella, Gymnomyces,* and *Macowanites* in North America, contributed by Zeller and Dodge to the *Annals of the Missouri Botanical Garden* for February, 1919, *Arcangeliella caudata, Gymnomyces Gardneri,* and *Macowanites echinosporus,* all from California, are described as new.

"Winter Botany" is a handy little volume written and published by Professor William Trelease in 1918, containing 394 pages of description and numerous text figures, enabling one to identify hardy plants in the winter season. This volume will be helpful especially to mycologists who are collecting fungi in the autumn and spring.

A revision of the Argentine Laboulbeniales by Spegazzini appeared in the *Anales del Museo Nacional* **29**: 445–688. 1917, a copy of which has just been received at the Garden library. The treatment of this group is very extensive and thorough, with carefully drawn descriptions and excellent text figures of 213 species, many of which are new.

A bulletin on the potato wart disease mentioned in MYCOLOGIA for January has recently been prepared by C. R. Orton and F. D. Kern of the Pennsylvania State College. The authors recommend a strict quarantine to prevent this very serious disease from being introduced into other localities.

A very extensive paper on the biology of *Polyporus pargamenus* Fries, by Arthur S. Rhoads, appeared last year as Technical Publication No. 11 of the New York State College of Forestry. In it this extremely common and widely distributed fungus is thoroughly discussed, described, and figured. The paper contains 197 pages of text and 31 plates.

The heart-rot of Western Hemlock is discussed by J. R. Weir and E. E. Hubert in Bulletin 722 of the U. S. Department of Agriculture. The fungus causing this disease, *Echinodontium tinctorium,* is ordinarily known as the Indian paint fungus, because of its use by the Indians of the Northwest for war paint. The authors suggest cutting the infected trees and destroying by fire all material that might disseminate the spores of the fungus.

An article on the wet-rot of Para rubber roots, by W. N. C. Belgrave, forms the subject of Bulletin No. 28 of the Department of Agriculture of the Federated Malay States. This disease, formerly attributed to *Poria hypolateritia,* is now said to be caused by *Fomes pseudo-ferreus.* The treatment of trees affected by this fungus is said to be of little use. Prevention by clean clearing of jungle stumps is recommended.

A new species of Amanita, *A. mutabilis,* is described by Beardslee in the March number of the *Journal of the Elisha Mitchell Scientific Society,* as occurring in white sand on Davis Island, North Carolina. The characters of this species are said to suggest a relationship to *A. pantherina* and *A. cothurnata.* The pileus is white or pale-yellowish and the context of the stipe changes to carmine in about three minutes.

An interesting account of the Physoderma disease of corn, by W. H. Tisdale, appeared in the *Journal of Agricultural Research* for February 3, 1919. This disease occurs throughout the United States as far westward as Texas and Nebraska and northward to southern Minnesota and New Jersey, considerable damage having been done in the Atlantic and Gulf coast states and in the Mississippi valley.

Dr. W. C. Coker has published another one of his valuable, handsomely illustrated articles on larger fungi of North Carolina. This article is entitled "The Hydnums of North Carolina." Almost the entire March number of the *Journal of the Elisha Mitchell Scientific Society* is devoted to this interesting group of

fungi. There are many illustrations, two of them being colored plates. Banker's nomenclature is followed in the main. Three species are described as new, *Hydnellum ferrugipes, Hydnellum carolinianum,* and *Phellodon Cokeri.*

A popular article on cedar rust, by Dr. F. D. Fromme, of the Virginia Agricultural Experiment Station, appeared in the report of the twenty-third annual session of the Virginia State Horticultural Society. Dr. Fromme says: "Cedar eradication is the cheapest form of orchard insurance you can buy. The cost on the average is less than the cost of a single spray application. Cut down the cedars and you will realize the benefits. There are thousands of cedars waiting for the axe."

The development of *Stropharia epimyces* is the subject of an article by W. B. McDougall in the March number of *The Botanical Gazette.* This very interesting fungus has been placed in several genera and the fact that it always occurs as a parasite on another mushroom lends added interest to it. Regarding its identity with *Pilosace algeriensis,* as suggested by Harper, the author says: "While it is entirely possible that this may be true, our plant cannot belong to *Pilosace,* as we understand that genus, since it has an annulus and the lamellae are not free."

Several parts of Dr. Kauffman's work on the fungi of Michigan have recently appeared as reprints from Publication 26 of the *Michigan Geological and Biological Survey.* The genera treated in these reprints are *Cortinarius, Lepiota, Clitocybe, Hygrophorus, Collybia, Russula, Pholiota, Amanita,* and *Coprinus,* the last genus having been contributed by Professor Pennington. The plates to accompany Dr. Kauffman's work will not appear until the entire publication is issued. These papers contain few new species except in the genus *Cortinarius,* to which about a dozen are added.

The "Manual of Tree Diseases," by Dr. W. H. Rankin, has recently been issued by The Macmillan Company. It is a volume of about 400 pages, illustrated with 70 figures. The various diseases are classified under the trees on which they occur and the

trees are arranged in alphabetical order. Subjects of a general nature are treated in the first part of the book. The author's training and experience enable him to speak with authority and this work may be recommended without reservation to mycologists, foresters and others interested in this very far-reaching and important subject.

Professor Guy West Wilson recently sent in from Clemson College, South Carolina, a specimen of *Daedalea juniperina*, collected on a red cedar trunk on the campus. The tree had been pruned and was seriously infected with the fungus on a number of the pruning wounds. This rare species of *Daedalea* was described from specimens collected at Rockport, Kansas, and was afterwards found in Missouri. Another rare fungus collected by Professor Wilson at Clemson College is *Coltriciella dependens*, which he found growing inside a rotten oak log. This species had been previously known from specimens collected on decorticated pine wood in the Carolinas and on yellow poplar wood in Florida.

Bulletin 707 of the U. S. Department of Agriculture is of peculiar interest to mycologists who have charge of herbaria because it gives the results of numerous experiments undertaken by the Bureau of Entomology with miscellaneous substances employed in destroying various insects. Among the substances used, napthalene proved effective in preventing infestation and in killing all stages of insects. Camphor did its work more slowly, while red cedar chips and pyrethrum powder were only moderately effective. The results here outlined support our own conclusions, derived from experiments and practical experience over a long period of years, that napthalene flake is the best insecticide for the herbarium of larger fungi.

In a recent paper by W. B. McDougall in *The Plant World* on the classification of symbiotic phenomena, the following statement appears: "Probably no one will dispute the status of lichens but some may object to speaking of lichens as symbiotic phe-

nomena at all, since some prominent botanists have recently adopted the rather peculiar notion that lichens are simply fungi. The word lichen, however, has been used for a long time to mean the composite structure that results from the symbiosis of lichen-fungi with algae, and no very good reason has yet been given for changing its meaning. A lichen-fungus is a fungus; it is not a lichen. There is no more reason for calling a lichen a fungus than there is for calling a mycorhiza a fungus; and it is just as absurd to call a lichen-fungus a lichen as it would be to call a mushroom a mycorhiza."

BAHAMA FUNGI

Mr. L. J. K. Brace has been sending in a number of fungi of late, collected by him in the Bahamas. Most of the more conspicuous species in his collections are quite widely distributed in tropical America, but the following are worthy of note, especially because very little mycological work has been done in these islands:

Hypochnus spongiosus, Septobasidium cirratum, Stereum candidum, Merulius corium, Coriolus abietinus, Coriolus sericeohirsutus, Fulvifomes dependens, Fulvifomes Swieteniae, Ganoderma pulverulentum, Inonotus fruticum, Inonotus porrectus, Trametes submurina, Tyromyces palustris, Chlorophyllum molybdites, Gymnopilus tenuis, Resupinatus subbarbatulus, Stropharia floccosa, Cyathus pallidus, and *Diplocystis Wrightii.*

Polyporus Bracei sp. nov.

Pileus flabelliform to circular, depressed, thin, usually cespitose, 8–15 cm. broad, larger by confluence; surface covered with fine tomentum scarcely visible to the unaided eye, somewhat uneven, azonate, uniformly dirty-white to pale-isabelline-avellaneous, margin thin, often undulate or lobed; context soft and punky, but fragile, homogeneous, pale-yellowish, 1–5 mm. or more thick; tubes decurrent, dirty-white, turning darker when bruised, scarcely 1 mm. long, mouths very minute, irregular, variable, 4–6 to a mm.; spores ellipsoid, smooth, hyaline, minute; stipe normally central, short, enlarged at the base, colored and clothed like the pileus where not covered with whitish mycelium, reaching 3 cm. long and 2 cm. thick, sometimes reduced to a mere tubercle.

Type collected in New Providence, Bahamas, in the autumn of 1918, by L. J. K. Brace.

HABITAT: On the ground, attached to sticks and buried wood.
DISTRIBUTION: Known only from the type locality.

W. A. MURRILL

A NEW SPECIES OF LENTINUS FROM MINNESOTA

Splendid specimens of an interesting species of *Lentinus* were received for determination in August, 1917, from Dr. E. M. Freeman, who wrote me, as follows:

"The specimens were collected at Itasca Park (Lake Itasca), Minn., on a large old log which was not identified, but probably was a conifer of some sort. The sporophores varied from four to eight (or ten) inches across and were almost uniformly flesh-colored all over. They had a very pleasant odor, somewhat resembling pineapple. They had the general appearance of a *Lentinus* with the rooting base, and the specimens which I am sending in a separate package show their non-putrescent character. The branching and anastomosing of the gills was very marked, while the teeth on the gill edge were very inconspicuous. The sporophores grew in a cluster. They have been partially eaten by squirrels or other animals. I have never seen this fungus before, although I have collected at this park for almost ten years."

Being unable to recognize Dr. Freeman's plant or to associate it definitely with any known herbarium specimen or description, I have decided to publish it as new and to dedicate it to the discoverer.

Lentinus Freemanii sp. nov.

Pileus very large, circular, plane, cespitose, 10–20 cm. or more broad; surface dry, finely hispid-tomentose, uniformly dark-rosy-isabelline when fresh, becoming somewhat paler on drying; context white, unchanging, reaching 4 cm. in thickness near the center, eaten by squirrels or other animals, having a pleasant odor resembling that of pineapples; lamellae long-decurrent, thin, very narrow and very crowded, branched and anastomosing, rosy-isabelline, becoming dark-purplish-brown when bruised, very slightly dentate on the edges, usually splitting into plates or lacerate with age; spores narrowly-oblong, usually curved and pointed at one end, smooth, hyaline, 9–11 × 3.5 μ; stipe central, curved, solid, rather slender, usually enlarged near the base and expanding into the pileus at the apex, clothed and colored like the pileus where not covered with decurrent lamellae, 8–15 cm. long, 2–4 cm. thick.

Type collected at Itasca Park, Minnesota, August, 1917, by E. M. Freeman.

HABITAT: On an old log, probably of a conifer.
DISTRIBUTION: Known only from the type locality.

W. A. MURRILL

FUNGI FROM ECUADOR

In the autmun of 1918, Dr. J. N. Rose collected a number of woody and fleshy fungi in Ecuador and sent them to the Garden for determination and distribution. Most of the gill-fungi were small, poorly preserved, and without notes, but the woody forms came through in very good condition. *Pyropolyporus inflexibilis*, from Portovelo, and *Cookeina sulcipes*, from Bucay, were represented by single specimens that could not easily be divided. Three sets were made of the species listed below, one going to Washington, one to Harvard, and one remaining here. The great majority of these species were collected in the vicinity of Huigra; several at Ventura and Bucay; and a few at Portovelo, Loja, Durán, Cumbe, Cañar and Tablón de Oña.

Species deserving special mention are: *Gymnopus tenuipes* (Huigra); *Crepidotus calolepidoides* (Tablón de Oña); *Fomes subferreus* (Cañar); *Trametes lignea* (Huigra), previously known only from one collection made in Nicaragua; and *Lentinus hirtiformis* (Ventura), previously known only from British Honduras. The specimens of this last species obtained by Dr. Rose in Ecuador are much larger than the types, and the stipes are covered with a brown, velvety tomentum.

SPECIES DISTRIBUTED

Auricularia Auricula nigrescens
Coriolopsis occidentalis rigida
Coriolus maximus
pavonius
versicolor
Crepidotus calolepidoides
Daedalea amanitoides
Earliella corrugata
Elfvingia tornata
Favolus tenuis
Fomes subferreus
Fomitella supina
Gloeoporus candidus
Gymnopus tenuipes
Hapalopilus gilvus licnoides
Hymenochaete Sallei
Lentodiellum concavum
Lentinus crinitus
hirtiformis
Pogonomyces hydnoides
Polyporus tricholoma
Pycnoporus sanguineus
Rigidoporus surinamensis
Schizophyllus alneus
Trametes lignea

W. A. MURRILL

QUEER FUNGOUS GROWTHS

The peculiar growth figured herewith was sent to me last November by Dr. J. J. Taubenhaus, of the Texas Agricultural Experiment Station, who obtained it from Mr. J. S. Watson, of Stephenville, Texas. Mr. Watson says that this growth, known locally as "oil bloom" or "gas stool," appears in the spring-time year after year on a small area of land where gas has been found. "It is in no way connected with any kind of timber," writes Mr. Watson, "as it grows out in the open on a farm which has been in cultivation for quite a number of years; and is on high, dry, sandy land; and it grows above the surface and is not plowed up; and there is no weed growth of any kind that grows with it. Some of the stools are very much larger than the

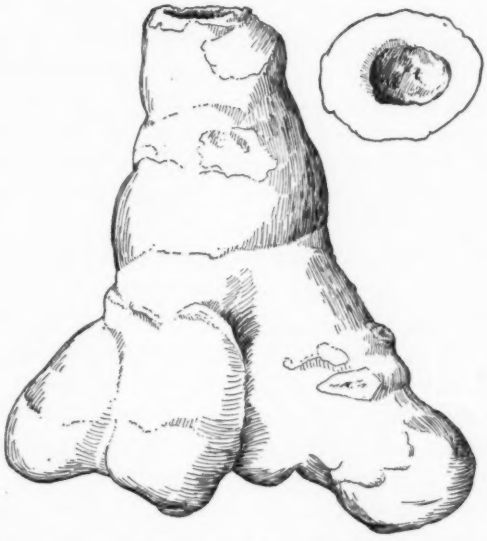

FIG. 1. A specimen of "oil bloom" from Texas, one-half natural size.

ones I sent, and when they are forming they look very much the color of Baumont crude oil."

Peculiar sterile forms like these should be studied where they occur by a competent mycologist, but a brief discription can do

no harm and some conjectures as to their probable nature and origin may be of sufficient interest to lead to further investigation.

I have two specimens, one simple and the other branched as shown in the figure, so as to resemble a clumsy foot of bird or beast with two double toes. The branched one shows four zones of growth, and, about an inch from the tips of the spreading "toes," the color changes from uniform dark-avellaneous with a brownish tint to dirty-white with here and there a creamy tint, which is also the color of the interior. If there is a cortex, it is very thin and chiefly distinguished by the change in color, but there is a definite tendency in the growths to take definite shape and limit their development both laterally and longitudinally.

These growths are heavy and almost entirely composed of sand, which may be felt over the whole surface and seen under a hand lens intimately mixed with fungous mycelium. The central core is free from sand, being composed of the decayed remains of a root or other form of vegetable matter showing large vascular elements. Sand is also absent from the growing tips of both specimens in one or two limited areas where the mycelium has massed on the surface in a thin white layer or in the form of brown punky tissue as though a fruiting surface of some kind were about to be formed.

It is probable that these masses of mycelium developed in association with roots surrounded by sand, which was intimately included by the mycelium as it grew. It may be that the sand was moist when the growths developed and afterwards became dry and shifted so as to reveal the growths. Forms similar to these often occur in mines and other dark places where developing sporophores are seeking the light; the darkness causing them to remain sterile and very abnormal in form and color. The Tuckahoe is an underground sclerotium, or mass of resting mycelium, which sends up a sporophore when the proper time arrives and the conditions are suitable.

W. A. MURRILL

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